Science in Medieval Jewish Cultures

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EDITED BY

Gad Freudenthal

CAMBRIDGE

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Science in Medieval Jewish Cultures provides the first comprehensive overview by world-renowned experts of what we know today of medieval Jews' engagement with the sciences. Many medieval Jews, whether living in Islamic or Christian civilizations, joined Maimonides in accepting the rationalist philosophical-scientific tradition and appropriated extensive bodies of scientific knowledge in various disciplines: astronomy, astrology, mathematics, logic, physics, meteorology, biology, psychology, the science of language, and medicine. The appropriated texts – in the original or in Hebrew translation – were the starting points for Jews' own contributions to medieval science and also informed other literary genres: religious-philosophical works, biblical commentaries, and even *belles lettres* and halakhic (legal) discussions. This volume's essays will provide readers with background knowledge of medieval scientific thought necessary to properly understand this wide array of canonical Jewish literature. Its breadth reflects the diversity of Jewish cultures in the Middle Ages and the need to consider the fortunes of science in each one within its specific context.

Gad Freudenthal is a Senior Research Fellow (Emeritus) at the Centre national de la recherche scientifique (CNRS) in Paris and teaches in the Department of Philosophy at the University of Geneva. He is the author and editor of several volumes on the history of science in antiquity and in the Middle Ages, especially in Jewish cultures; his most recent book is *Science in the Medieval Hebrew and Arabic Traditions* (2005). He is also editor of the journal *Aleph: Historical Studies in Science and Judaism.*

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For my parents, Renate and Heinz Freudenthal,

in loving memory

and

for my sons, Emmanuel and Michael,

in love.

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Preface and Acknowledgments

This volume on the history of science in medieval Jewish cultures has its own history. My first attempt, in 2000, to produce a volume on "Science in Medieval Jewish Cultures" did not bear fruit. I then joined forces with Prof. Mark Geller of the Institute of Jewish Studies, University College, London, in organizing an international conference on "Science in Medieval Jewish Thought," held at the Institute of Jewish Studies in London on June 16–19, 2003. This conference brought together eighteen scholars, most of whom subsequently wrote papers that are included here. I am grateful to Prof. Geller for his very friendly collaboration and to the Institute of Jewish Studies for its partial support for the preparation of this volume.

Other scholars joined the venture later, some of them through a study group on the "Transmission and Appropriation of the Secular Sciences and Philosophy in Medieval Judaism: Comparative Perspectives, Universal and National Aspects," led by Prof. Ruth Glasner of the Hebrew University of Jerusalem and by me at the Jerusalem Institute for Advanced Study (IAS) from March to August 2007. It was in the particularly agreeable ambiance of IAS that the enterprise finally neared completion. IAS also partly supported the publication of this volume, and its help is gratefully acknowledged.

This collection has been five long years in preparation. For their sage advice and crucial support on more than one occasion, I am much indebted to Prof. Ruth Glasner and to Prof. Bernard R. Goldstein (Pittsburgh). Two readers for Cambridge University Press made very insightful and useful suggestions: I am grateful to them for their close reading of the entire volume, although time constraints did not allow me to follow their advice as fully as I would have wished. To Mr. Lenn Schramm (Jerusalem) I am once again most grateful for his exigent and resourceful editorial work on the text of the entire volume.

It is with great pleasure that I express my deep appreciation and thanks also to the twenty scholars who generously contributed of the fruits of their knowledge and labor to this volume and patiently endured the years during which it was in the making. I have repeatedly asked them to join me in accepting the following sage advice, which I owe to Franz Rosenthal: "Do not try to do whatever you do in a hurry, but try to do it well; for people will not ask how long it took a man to do a particular piece of work, but they will ask how well he did it."[1]

[1] This saying, ascribed to Plato by Arabic medieval scholars, is quoted by Franz Rosenthal in his introduction to *The Muqaddimah: An Introduction to History* by Ibn Khaldun, trans. Franz Rosenthal, 2nd ed. (Princeton: Princeton University Press, 1967), p. xxiv.

Last but not least, I record my indebtedness to the Centre national de la recherche scientifique (CNRS) in Paris, which gave me unrestricted liberty to engage in research for many years. My former director at the CNRS, Prof. Roshdi Rashed, deserves my special gratitude for having lured me to this area of research and for his continued friendship over more than three decades. The *Encyclopedia of the History of Arabic Science* (Routledge, 1996), which he edited in collaboration with Prof. Régis Morelon, was an obvious source of inspiration for the present volume.

G. F.

Introduction: The History of Science in Medieval Jewish Cultures

Toward a Definition of the Agenda

Gad Freudenthal

Is there an object out there answering to the name, "the history of science in medieval Jewish cultures"? Or is the history of the scientific activity of medieval Jewish scholars part and parcel of the contemporary activity in the various majority cultures in which they lived, which therefore provide the appropriate contexts for examining the history of science practiced by Jewish individuals? Inasmuch as science is the universal intellectual activity par excellence, is the history of its practice by a minority culture separable from its practice by the majority culture? Isn't the very notion of a "history of science in medieval Jewish cultures" an artificial construct informed by ethnic, nationalistic, or apologetic concerns? These are some of the questions that may cross readers' minds when they encounter the title of this book.

It is certainly not the intention to produce here a twenty-first-century remake of the "famous Jews in science" genre. Rather, the title signals the belief that the history of the absorption and practice of science within various medieval Jewish cultures constitutes a clearly identifiable object of fruitful historical investigation. Differences in local conditions notwithstanding, there is a certain inner connectedness in the story of the fortunes of science in medieval Jewish cultures. This is what makes it an intellectually legitimate and potentially fertile object of research – on the condition, to be sure, that the accounts of the practice of science by Jews are not oblivious to the respective larger, non-Jewish contexts.

One important point should be emphasized from the outset: There was not one society or one culture of medieval Jews but many. At any point in time, a multitude of very different Jewish outlooks coexisted. By "outlook" I loosely refer to the sum total of beliefs and views held to be true and norms taken as binding: It includes the set of books regarded as authoritative, the views of God and His relation to the world (theology), the interpretations of Jewish Law, and the like. Clearly, the overlap between the beliefs, say, of Maimonides and a contemporary tosafist in northern France is almost nil: They belonged to altogether different cultural systems, albeit ones that were both Jewish. Often different Jewish cultures coexisted even within a single community.

The polyphonic character of Jewish cultures was clearly perceived by a contemporary observer – the noted translator, mathematician, and poet Qalonymos ben Qalonymos (1286–after 1328), who lived in southern France and in Italy. In his poetic work *Even boḥan*

(Touchstone), which offers an amused, sarcastic-ironic view of the state of society in his day, he wrote,[1]

> Each and every district clings to its own beliefs.
> One follows its God in naive faith, devoid of rigor and profundity.
> Another innocently upholds God's corporeality;
> Yet others treat God kabbalistically or philosophically.
> And each man defames his neighbor, saying, "I fear he may have sinned,
> He may be tainted with heresy."
> His God is not like mine, and my portion is not his.

Qalonymos insightfully concludes, "Our Gods are as numerous as our towns" (cf. Jer. 2:28 and 11:13). This felicitous phrase underlines that any generalizations about *the* medieval Jewish attitude to science (or whatever) are misguided; the intellectual activity of medieval Jewish individuals has to be situated in the respective immediate (i.e., *local*) cultural contexts.

Medieval (and later) Jewish cultures were multiple, then, and each needs to be treated separately. It is erroneous, misleading, and unfruitful to refer to "Jewish culture" in the singular. (It is another question how, despite the centrifugal tendencies at work, the self-perception of all these cultures as belonging to one overarching entity called "Judaism" has been maintained, but that is not our concern here.) This idea is a cornerstone of this volume, and it is reflected in its title. The contributors to this volume, too, have sought to keep different cultures apart and to situate developments in their respective local contexts.[2]

Let us now turn to the historiographic perspective underlying this volume. It is the result of the interaction or hybridization (a concept originated by the sociologist Joseph Ben-David) of two disciplines: the history of science, on the one hand, and Jewish studies or, more precisely, Jewish cultural history, on the other. In the second half of the twentieth century, the agendas of both disciplines underwent profound conceptual and methodological changes, which have allowed them to interact in new ways and opened the route for novel perspectives on medieval Jewish scholars' engagement with science. Specifically, both disciplines moved away from apologetic or congratulatory postures toward the direction of attitudes close to those adopted by cultural studies. Their parallel evolutions have made it possible to redefine anew the objectives of studying the history of the scientific activity by medieval Jews. Let me explain briefly.

"Turns" in the History of Science

The history of science is almost as old as science itself and is in a way the natural outgrowth of the practice of science. Scientists, especially great scientists, often view themselves as standing on the shoulders of giants, whom they wish to identify. The mathematician who builds on a theorem often associates it with the individual who was the first to prove it. The physicist who draws on a law of nature to build an instrument or set up an experiment may similarly wish to know who established the fact he or she takes for granted. Note the use of the words "fact" and "established": The intuitive philosophy of science of most practicing scientists is a positivism that views science as an ever-growing collection of timeless and context-independent truths.

[1] *Even boḥan*, ed. A. M. Habermann (Tel Aviv: Maḥbarot le-sifrut, 1956), p. 44; translation by Susan Einbinder (HUC, Cincinnati), to whom I express my sincere thanks.

[2] While this volume was in gestation, David Biale edited and published *Cultures of the Jews: A New History* (New York: Schocken, 2002). The plurality of cultures in his title is of a very different kind from that to which I refer here. For him, "cultures" in the plural seems to allude to the different *kinds* of culture – material, artistic, intellectual, etc. – of which each individual partakes (see p. xvii). As far as I can see, the idea that at any point in time "Judaism" consists of a network of different cultures has not been touched upon in his useful volume.

These truths can be facts, generalizations from facts, or theories. From the viewpoint of this positivist philosophy of science, it obviously makes much sense to ask who first established a given item of knowledge.[3]

Relevant here is that positivism, as the philosophy of science embraced by both scientists and philosophers of science, shaped the traditional historiography of science. Historians of science viewed science as a set of established facts and theories. Concomitantly, they viewed science as a closed system in which progress depended only on research problems generated by science itself. Put differently, positivists perceived science as a self-contained, autonomous system. Until a few decades ago, most histories of science were indeed written without much attention to extrascientific developments, whether intellectual, social, or economic. This tendency was reinforced by the circumstance that historians of science were usually trained in the sciences, and only in the sciences, and subsequently worked in relative isolation from other disciplines. Sociologically, this meant that, as an academic field, the history of science developed a strong professional identity of its own, with historians of science talking primarily to one another. Specifically, scholars studying the history of science within a given culture communicated mainly with other historians of the same scientific discipline, and not with scholars studying other facets of the same culture.

This insular tendency of the discipline was congruent with another feature of positivism: namely, the belief in rationality as a driving force in history, especially in the history of science. The narrative of the history of science usually proceeded on the implicit assumption that humankind is rational and that science, the rational activity par excellence, would progressively push back ignorance and superstition. What is important in the present context is that positivism, like most optimistic, future-oriented rationalist philosophies of history, had little interest in or even patience for setbacks, errors, or failures. What counted were the real, positive *contributions* to science – that is, new discoveries. Scientists who spent their lives in research but who never achieved a tangible, established outcome that expanded the frontiers of knowledge and contracted those of ignorance had no place in this narrative. Nay, in positivist historiography of science, even a person who made a discovery but, as it turned out, was not the first to have made it did not "contribute" to science and thus was at best allowed an appreciative nod in a footnote to the account devoted to *the* (i.e., the first) discoverer. From a positivist point of view, it is not an individual's effort or ingenuity that matters, but only the bottom line – the net contribution to scientific progress.

Were we to look at science as practiced by medieval Jews from a positivist vantage point, the title of this book would have been "The Contributions by Jews to Science in the Middle Ages," and the contributors would have been asked to list discoveries made by individual medieval Jews that increased the previously existing body of knowledge. Then, however, there would have been no need for this book, and for two reasons. The first is that the task of tracking down and listing the contributions to science made by Jews (medieval or others) has already been accomplished to a great extent by our forerunners, the founders of the *Wissenschaft des Judentums* and their successors. Indeed, in its beginnings, many of the practitioners and supporters of the *Wissenschaft des Judentums* adopted a stance that was deliberately apologetic, seeking to demonstrate that Jews, too, like the followers of other faiths, contributed to science.[4] The main target they set themselves was to refute a prevailing

3 So natural and intuitive is this view of science to scientists that it has become socially integrated into scientific practice itself, as reflected in the tradition of naming particularly important pieces of new knowledge after their discoverers. Robert K. Merton has shown that this practice – he called it "eponymy" – is a part of the social reward system of science.

4 A characteristic example of a work in this spirit is Solomon Gandz, *Studies in Hebrew Astronomy and Mathematics* (New York: Ktav, 1970). Kindred in spirit are George Sarton, *Introduction to the History of Science* (Washington, D.C., 1927–48), and Edwyn Bevan and Charles Singer, eds., *The Legacy of Israel* (Oxford: Clarendon Press

image of the Jewish scholar as engaged in sterile talmudic hairsplitting, a stereotype shared by antisemites and Jewish *maskilim* alike. Felicitously, this aim was in keeping with the outlook of their contemporary positivist historians of science. The research initiated by the *Wissenschaft des Judentums* and subsequently carried further by later scholars produced highly important results on which present-day research constantly draws, but it seems fair to summarize its outcome by saying that medieval Jews played a fairly limited role in advancing science. They were important as cultural intermediaries, in the transfer of scientific knowledge from East to West, from Arabic into Hebrew and Latin; they also were creators of some new scientific knowledge, mainly in astronomy, in whose cultivation they often participated on equal footing with their Muslim and Christian counterparts. Overall, however, the positive contributions by Jews to medieval science were relatively meager and cannot be compared to those of medieval Muslim or Christian scientific cultures. From a positivist perspective, then, the intersection of the history of science and of Jewish studies is small. This is the second reason why a positivistically oriented volume on "The Contributions by Jews to Science in the Middle Ages" would have been a non-starter.

Today, however, the intellectual landscape has changed, allowing for a new approach to the historical study of the scientific activity of medieval Jews. In the 1960s and 1970s, the history of science witnessed the emergence of new perspectives that radically modified the discipline's outlook and *problématiques*. In one innovative move, scholars posited that the interest in positive scientific results should be complemented by attention to the *thought processes* that produced them: The focus on a *contribution* has been enlarged to include the *individual thinker* behind it. This broadening of the former positivist framework of analysis was accomplished by scholars who introduced approaches deriving from the history of philosophy into the history of science. Coming from the hermeneutical tradition that can be traced to Wilhelm Dilthey (1833–1911), they construed their task as understanding the historical actor who produced an intellectual construct ("discovery") in his (or, more rarely, her) own terms, expecting the interpreter to transfer him- or herself (*sich hineinversetzen*) into the mindset of the scientist studied and to try to reconstruct the creative thought processes that led to the intellectual construct under discussion. The historian who did most to introduce this tradition into the history of science was Alexandre Koyré (1892–1964). In a series of groundbreaking case studies written in the 1950s, he made the point that the history of science cannot be studied in isolation; to understand the genesis of a scientific fact or a theory, one has to attend to its author's *entire* thought, no matter if its premises are scientific or nonscientific, rational or nonrational, or even irrational. Of course, this is not to say that every scientific fact or theory is the product of dark, irrational forces, but whether or not this is the situation has to be determined by historical research in each and every case. Since Koyré, whose approach had been adumbrated or paralleled in some respects by historians of science such as Pierre Duhem (1861–1916), Gaston Bachelard (1884–1962), Anneliese Maier (1905–71), Hélène Metzger (1888–1944), Ludwik Fleck (1896–1961), and others, the thinking of many a great scientist has been shown to include various components other than strictly scientific – notably, philosophical – that in one way or another nurtured their scientific work. The new approach, which deprived science as a body of knowledge of its former epistemological insularity, was soon articulated by the anti-positivist philosophers of science of the 1960s and 1970s, above all by Thomas S. Kuhn (1922–96). It opened the way to a further, notably social contextualization of science.

1965). It is important to note that Moritz Steinschneider, a scholar in the tradition of the *Wissenschaft* who contributed more than anyone else to the study of the scientific activity of medieval Jews, was vehemently opposed to any apologetics. See Reimund Leicht and Gad Freudenthal, eds., *Studies on Moritz Steinschneider* (Leiden and Boston: Brill, forthcoming).

This redefinition of the agenda of the history of science signaled a blurring of demarcations and a lowering of barriers: Instead of juxtaposing science and nonscience, rational thought and irrational beliefs, historians now began to construe science as the outgrowth of different frames of mind, some more rational than others. The various kinds of human beliefs within the thought of a given individual may interact, making it impossible to view science as the outcome of pure human rationality alone. Consequently, although historians of science remain primarily interested in thought processes whose outcome has entered the annals of science (and not, say, the annals of magic, superstition, or religious doctrines), this new definition of the subject matter of the discipline still implies that they may have to attend to nonscientific thought and work much harder: They now have to study not only the strictly scientific ideas of a past scientist but also *all* the beliefs held by that scientist that may have nurtured his or her thought, and often also the social context in which he or she worked. To give but one example, in the case of Isaac Newton, this means that in addition to the history of astronomy, physics, and mathematics, one must also study theology, alchemy, and other nonscientific subjects. This development clearly favors the inclusion of religious aspects in the narrative of the history of science.

A second new perspective that has enriched the *problématiques* studied by historians of science is sociological. I have in mind the tradition that goes back to Max Weber (1864–1920) and that was applied to the history of science in the seminal works of Robert K. Merton (1910–2003) and Joseph Ben-David (1920–86). In a nutshell, both followed Weber's crucial insight that "the belief in the value of scientific truth is not derived from nature but is a product of definite cultures." Consequently, they assumed that the growth of science will be bolstered where there is a convergence between the general values of a given culture and those of science: Such a convergence will favor the social legitimacy and institutionalization of scientific roles and practice and will also motivate individuals to apply themselves to it, with the converse holding as well. This paradigm is particularly apt for the sociological study of the relationship of science and religion; its application to a historical case study famously led to Merton's thesis concerning the so-called Protestant spur to early modern science. In the last two or three decades, this kind of sociology of science has to some extent fallen into desuetude, but I still consider it to be critically important for a sociologically informed study of the history of science, especially of science's relationships to religious thinking and institutions. A more recent sociological tradition, the "sociology of scientific knowledge," goes further in that it tries to establish a causal link between aspects of an actor's social context and interests and his or her scientific ideas. Whatever the merits of this research program, it certainly helped end the solipsism that characterized the earlier history of science, making room for the inclusion of religious elements in the accounts given by historians of science.

These two "turns" in the study of the history of science – the hermeneutic and the sociological – are parallel in that they allow and indeed demand the introduction of extrascientific elements into the accounts of how science evolves. Foremost among these extrascientific elements are intellectual and social variables, some of which may be related to an individual's commitment to a religion or a minority culture. The inclusion of these elements clearly opens the gate for an alliance between the history of science and Jewish cultural history.

"Turns" in the Field of Jewish Studies

Jewish studies, too, changed in the second half of the twentieth century. The field's evolution cannot and need not be traced here.[5] I note only the following. First, the earlier apologetic

[5] For an overview, see Martin Goodman and David Sorkin, eds., *Oxford Handbook of Jewish Studies* (Oxford: Oxford University Press, 2002).

tendency has vanished almost completely; historians today are less and less preoccupied by the "image of the Jew" that their studies may imply. Instead, they treat their material as would any other student of a culture – with a distanced empathy. For example, the study of kabbalah, which nineteenth-century scholars shunned because of its perceived embarrassing irrationality, is now flourishing. A second related and more recent development is, in the words of Amos Funkenstein (1937–95), the disappearance of a comprehensive "master-narrative" in Jewish studies:

> Some recent historians seem to have lost the faith we all once shared in the existence of a single coherent and harmonious master-narrative representing reality. The place of that master-narrative . . . has been taken over by a discordant polyphony of competing and even contradictory voices, each with only relative validity, and all of them blurring and calling into question the borders between narratives and their referents, between signifier and signified.[6]

Jewish studies, then, have moved away from an explicit or implicit apologetic posture, including the need to demonstrate Jewish "contributions" to science. Its epistemological stance is more intent on satisfying scholarly norms than on responding to the concerns of a lay public.

A NEW ALLIANCE OF THE TWO DISCIPLINES

When we pull all the strands together, we find the following picture: The new construal of the scope and objectives of the history of science, on the one hand, and the developments within Jewish historiography, on the other, have set the stage for a new alliance between the two disciplines. This alliance has two aspects: (1) internal, associated with the history of ideas, and (2) external and sociological. The first considers the intellectual relations between ideas upheld within Judaism and the science elaborated by Jews; the second considers Jewish culture as a factor that socially encouraged or discouraged the practice of science by Jews. Consider them in turn.

Inasmuch as historians of science no longer limit their researches to the history of positive "contributions" to science, and inasmuch as historians of Jewish thought, too, no longer feel they must come up with Jewish "contributions" to universal culture, new legitimate and attractive topics of research emerge in both disciplines. For one thing, considering the work of a medieval Jewish scientist, one may ask (à la Koyré) whether ideas or *problématiques* deriving from his Jewish culture interfered with his scientific work in one way or another, irrespective of whether that work resulted in a positive contribution to science. (Answers in the affirmative can be offered for Maimonides, Gersonides, and Ḥasdai Crescas, among others.) For another, diverse views of nature and of natural phenomena held by medieval Jews, including some that were not scientific by any standard, have now become acceptable objects of historical research (examples are provided later). This new, broad, and nonpositivist stance creates a multileveled rapprochement between the perspectives and *problématiques* of the history of science and of Jewish studies, in which their disciplinary differences tend to blur.

This new perspective raises questions about the demarcation of the discipline. Consider just one example: If we recall that, in the medieval philosophical tradition, the material sublunar world was taken to be structured and held together by the active intellect, the last entity emanating from the First Intellect, then we quickly realize that it is not easy to separate the history of physical science from that of metaphysical thought. How, then, should we circumscribe the subject matter of the history of *science*? As far as this volume is concerned,

[6] See Amos Funkenstein, "Jewish History among the Thorns," pp. 309–27 in *Thinking Impossibilities: The Legacy of Amos Funkenstein*, ed. Robert S. Westman and David Biale (Toronto: University of Toronto Press, 2008), on p. 310; originally published (in Hebrew) in *Zion* 60 (1995): 335–47.

I deemed it best to avoid defining "science" in any formal way and instead to define the object of the history of medieval science loosely, as including all discussions bearing on conceptions of the natural world, in addition to formal thought (mainly logic and mathematics). First and foremost, this definition covers all works written by medieval Jewish authors within or with reference to the broad framework of the Greco-Arabic scientific tradition. This is a vast corpus bearing on the exact sciences, logic, natural philosophy, biology, metaphysics, and related disciplines. Most of these texts are in Arabic or in Hebrew (only a few are in various vernaculars). The proposed definition acknowledges the blurring of the borders between science and metaphysics and treats all reflections on nature as a continuum of related theories. It also allows the inclusion of thoughts about nature that fall outside this rationalist tradition, such as in *Sefer Yeṣirah* (Book of Creation). Similarly, we can include lapidaries, describing the (more or less magical) properties of gems, or mystically inclined texts like the accounts of natural phenomena written within the tradition of the German Pietists. Thus, although work by Jewish scholars in the rationalist tradition of Greco-Arabic science constitutes the hard core of the historian of science's study, texts from outside this tradition can provide an important complement to the picture. The unity and cohesion of the field have a pragmatic rather than theoretical basis.

I now come to the sociological component of the new alliance. Our point of departure is the assumption that, to understand properly what Jews did or did not do in the sciences during the Middle Ages, we have to situate the carriers and producers of knowledge in their social and cultural contexts and assess how the values of the local culture favorably or adversely influenced the practice of science. Among other things, we must be on the lookout for the roles played in society by medieval Jewish carriers and producers of knowledge.[7] A sociologically informed account of the scientific activity of individuals will have to consider their specific and local sociocultural context.

The new alliance between the disciplines of Jewish studies and the history of science is already taking shape: Scholars who study the science practiced within Jewish traditions come from different horizons and define their professional identities in a variety of ways. Those interested in Jewish thinkers' engagement with the exact sciences continue to relate to the work of their colleagues who study the history of these sciences in other cultures. These historians' professional identity is well established, and they contribute much both to the social coherence of our field of study and to maintaining its links with the academic discipline of the history of science. Other scholars, coming from Jewish studies, are interested in texts and processes that may not seem significant to "general" historians of science: In these cases, they situate the individuals and texts they study not in the context of the global history of science but also in that of the history of Jewish thought. They often relate to historians of kindred ideas in other cultures, although usually students of Jewish cultures are their main audience. Obviously these two groups of scholars share many research topics and interests, notwithstanding their partly different scholarly agendas and professional reference groups. Indeed, in the last decade or two, a small cross-disciplinary field of study has emerged, straddling the history of science and Jewish studies. This field has no intrinsic boundaries, chronological or other: Inasmuch as the intellectual activity (scientific or other) of an individual has been significantly informed by Jewish culture, he or she is a legitimate object of the kind of study here described. Clearly, because in modern times the work of scientists tends to have little to do with their possible Jewish background, the share of studies bearing on the premodern period tends to be preponderant. The scientific community now active

[7] This sentence obviously echoes the title of Joseph Ben-David's *The Scientist's Role in Society* (Englewood Cliffs: Prentice-Hall, 1971; 2nd ed., Chicago: University of Chicago Press, 1984). The influence of my late teacher's thought on the approach adopted here is unmistakable.

in this field has endeavored to institutionalize its existence through conferences and, since 2001, in a dedicated scholarly journal, *Aleph: Historical Studies in Science and Judaism.*

This brings us to a final question: If scientific ideas were not high on the agenda of most medieval Jewish scholars and if, moreover, their work was of limited consequence for the general history of science, then why should we bother studying the history of science within medieval Jewish cultures? There are, I think, at least four good justifications for this enterprise.

The first is obviously that the "Jewish component" in the history of medieval science is a significant component of the global picture. Two distinct levels must be taken into consideration here – that of scholars who creatively came to grips with science, and that of the "consumers" of scientific lore. On the first, traditional, level, we attend to Jews' positive contributions to astronomy and to their role as cultural intermediaries. This is too well known to call for elaboration. We also study intellectual gems that one finds here and there, as in the thinking of a Gersonides or a Ḥasdai Crescas in the rationalist tradition, or in the idiosyncratic thought of Judah the Pious in the more mystical tradition. Whether or not they made a difference for subsequent developments, studying them is intellectually rewarding. This is in keeping with wider tendencies in scholarship: Historiography in general, including the history of ideas, has moved away from the cult of "Great Men," and the study of how lesser luminaries apprehended the world is drawing increasing attention. This brings us to the second level of analysis, that of the place of science in Jewish intellectual life. Although only a few Jews made notable contributions to medieval science, many Jewish individuals were interested in science and studied it intensively. This unflagging interest in science is reflected in the considerable number of works offering introductions to science that were written in Hebrew (or translated into it) during the medieval period and were subsequently copied, transmitted, and studied. Also, more advanced scientific texts were studied by learned individuals who nonetheless never entered history. Although these individuals are "consumers" rather than creators of scientific knowledge, they are an integral part of the history of science: The *Annales* school of historiography has taught us that historical writing should not focus on past great events or important personages, but rather also study the lives of "ordinary people"; by the same token, studying the history of scientific thought should include within its purview how science was studied and transmitted by "ordinary" literate persons. This kind of study throws important light on the intellectual and spiritual world of Jewish medieval cultures.

A second reason for studying the Jewish medieval scientific tradition is its impact on other domains of Jewish thought. In many geographical areas and during many periods, practically all Jewish intellectuals appropriated at least some science. Consequently, scientific ideas and concepts permeate a large part of medieval writings, including in philosophy, biblical commentary, halakhah, belles lettres, and even kabbalah. Consequently, anyone who wishes to read medieval (and many post medieval) Jewish texts today must be familiar with the basics of medieval science. Studying the history of the reception, absorption, and further development of scientific ideas within medieval Jewish cultures is thus a prerequisite for the study of the history of Jewish thought, medieval and later.

The third reason is admittedly pragmatic, indeed pragmatic with a whiff of apologetics. The history of science is a well-entrenched, strongly institutionalized discipline that, owing notably to its connections with modern science and science policymaking, is increasingly visible in the public sphere. The scholarly consensus reached within this discipline ultimately shapes the general public's understanding of who contributed what to science, which is a central component of modernity. Societies, cultures, and minority groups vie for a significant place in this narrative, more openly and self-consciously today than in the past. Thus there is a certain ideological stake involved here; it is fitting and desirable that Jewish cultures not be absent from the narratives of medieval science offered to the general public by professional historians. In the European community, for example, there is an ongoing debate about Europe's "identity": Is it essentially Greek and Christian, or have "alien" inputs become a part of the European essence? In this context, it seems important that the input of Jewish (and other non-Christian) cultures into Europe's culture be highlighted, so as to allow its impact to be clearly perceived by the general public.

Last but not least, the reception and absorption of scientific and philosophical thought in the rationalist Greco-Arabic tradition by medieval Jewish cultures are central aspects of the general theme of "Athens and Jerusalem" (i.e., of Jewish attitudes toward general, non-Jewish culture).[8] The origins of this question go far back, but it became a fundamental cultural issue of Jewish life following the encounter between Judaism and Greco-Arabic culture in early Islam and has remained so to this very day. To cite only one example, Maimonides insisted that without Aristotle's help it was impossible to understand the Scriptures correctly; hence the study of the sciences was not only legitimate but also mandatory. Other Jewish authorities steadfastly held that the slightest compromise with philosophy placed Judaism in grave jeopardy. We have here two principled views of Judaism, one advocating openness toward the outer, gentile world and its cultures – "hear the truth from whoever utters it," as Maimonides put it – and the other insisting on closure and isolation. In the persistent, occasionally violent conflict between these two principled Jewish stances, science played an essential mediating role inasmuch as even those who have been hostile to the study of "alien wisdom" have recognized the utility of disciplines such as mathematics, astronomy, and medicine. Consequently, one aspect of our theme is the history of the acceptance or rejection of rationalist thought, and of "foreign" ideas in general, by the various medieval Jewish cultures. The history of attitudes to science is a significant, perhaps even crucial, dimension of Jewish cultural history that calls for description and analysis. With an eye to the present, we note that these historical studies may afford some insight into the nature of religious fundamentalism and its attitudes toward the scientific way of thinking. In short, the history of scientific thinking within medieval Judaism may not be an essential component of the history of science, but it certainly is a significant chapter in the cultural history of Judaism itself.

It does not seem necessary to me to offer here an overview of the contents of the volume; the chapter titles clearly enough indicate what they are about. Yet a short observation on how the completed volume relates to the programmatic ideas exposed earlier is in order.

Some ideas have been successfully implemented. Thus the volume includes chapters on subjects that often find no place in works on the history of science – for instance, astrology, astral magic, psychological theories, and theories of language. Similarly, the contributors endeavored to consider developments within different Jewish cultures separately, rather than to refer to an undifferentiated entity called "Judaism." By contrast, the goal of providing a culturally contextualized history of Jewish engagement with the different scientific disciplines was attained only partially: Whereas some contributions made important steps in this direction, other chapters provide more traditional accounts of textual history. They grapple with such Steinschneiderian questions as: Which texts were translated, when, where, and by whom; who studied these texts; and in what ways. This is inevitable inasmuch as at the present stage of scholarship, much spadework of this kind is still necessary before more contextual issues relating to cultural history can be broached.

[8] For an overview and bibliography, see Jacob J. Schacter, ed., *Judaism's Encounter with Other Cultures: Rejection or Integration?* (Northvale, N.J., and Jerusalem: Jason Aronson, 1997).

Contingent circumstances also played a role in shaping the volume. To my regret, a number of important topics have remained untreated – for example, science in the Talmud and its perception in the medieval period, the interaction between science and halakhah, the interaction between science and medicine, the impact of Hermetic writings on science, the reverberations of scientific lore in belles lettres, and the science of music. More felicitously, owing to other contingent circumstances, the volume includes not one but two (complementary) chapters on Jewish astrology (in addition to one on astral magic). It also is obviously the case that, owing to disparities in the progress of research in different areas (not to mention individual differences), the treatments of the various subjects are not equally exhaustive. This volume, then, represents a snapshot of the "state of the art" at a particular moment. It is hoped that it will contribute to the further development of our subdiscipline and that it will soon be outdated.

A distant ancestor of this text was presented to the Judaic Studies Faculty and Graduate Student Seminar at Yale University on September 14, 2005. I am grateful to the Program in Judaic Studies at Yale University, and especially to Prof. Ivan Marcus, for the invitation to spend the 2005–06 academic year at Yale as the Horace W. Goldsmith Visiting Professor in Judaic Studies. For their observations on a draft of this Introduction, I am much indebted to Profs. Ruth Glasner (Hebrew University of Jerusalem) and Bernard R. Goldstein (University of Pittsburgh).

PART I

THE GREEK-ARABIC SCIENTIFIC TRADITION AND ITS APPROPRIATION, ADAPTATION, AND DEVELOPMENT IN MEDIEVAL JEWISH CULTURES, EAST AND WEST

1

The Assimilation of Greco-Arabic Learning by Medieval Jewish Cultures

A Brief Bibliographic Introduction

Gad Freudenthal

"The Jewish people did not begin to philosophize because of an irresistible urge to do so. They received philosophy from outside sources, and the history of Jewish philosophy is a history of successive absorptions of foreign ideas which were then transformed and adapted to specific Jewish points of view."[1] Julius Guttmann's pertinent assessment applies to all the domains considered in this volume. Consequently, one could reasonably expect a volume entitled *Science in Medieval Jewish Cultures* to offer full descriptions of the bodies of knowledge that Jews appropriated during the Middle Ages, as well as detailed accounts of the process of appropriation itself. However, no attempt at such a comprehensive treatment is undertaken here, although many of the chapters that follow describe the assimilation of Greco-Arabic science in the specific domain addressed. The reason for this omission is that a number of thorough studies bearing on this multifold subject are available, and some are very recent, making yet another effort redundant. Hence it seems sufficient to offer here a short guide to the literature that will steer neophyte readers to relevant studies.

The assimilation of science and philosophy by medieval Jews in the Islamic world and by those in Christian Europe should be studied separately. The Arabophone Jews in the Islamic world had direct access to the many sources available in Arabic; in contrast, Jewish scholars living in Christian Europe as a rule did not read Latin, the educated language of the majority culture, and had access only to literature available in Hebrew. Consequently, "the history of successive absorptions" of foreign scientific and philosophical lore by medieval Jews must be addressed separately for these two cultural areas.

THE ISLAMIC WORLD

The assimilation of Arabic learning by Jews under Islam was a natural consequence of their adoption of Arabic as their vernacular. The appropriation of literary Arabic began with translations of the Bible, which were initially oral, that culminated, early in the tenth century, in the *tafsir* of Saadia Gaon (882–942). As knowledge of literary Arabic increased, some Jewish scholars acquainted themselves with contemporary science, philosophy, and even Muslim theology. Responding to challenges posed by the non-Jewish intellectual environment and by the Karaites, Rabbanite scholars – here too the towering figure is Saadia – wrote works to

[1] Julius Guttmann, *Philosophies of Judaism: The History of Jewish Philosophy from Biblical Times to Franz Rosenzweig*, trans. David W. Silverman (New York: Holt, Rinehart and Winston, 1964), p. 3.

demonstrate that the Jewish faith is consonant with reason and philosophy. At the same time, scholars in North Africa, notably in Kairouan, also appropriated philosophy and science. The literary fruits of the Judeo-Arabic cultures were all in Arabic, or rather Judeo-Arabic.

In the Iberian peninsula, too, Jews spoke Judeo-Arabic and studied Arabic science and philosophy. As in the East, they composed theoretical works grounded in Arabic scholarship: Bible commentaries, Hebrew grammars, treatises of religious philosophy, as well as works on philosophy tout court, all in Arabic.[2] Much more than in the East, however, in Iberia the blossoming of Jewish thought in Judeo-Arabic was accompanied by the rise of an extraordinarily rich culture of poetry and prose in Hebrew.

For our purposes here, the salient point is that Jewish scholars in the Islamic sphere had access, in principle, to the entire corpus of Greco-Arabic learning. Consequently research on the assimilation of science and philosophy by Jewish scholars takes the form of studies of the sources on which a given Jewish author drew or of the reception of a given corpus of Arabic writings by Jewish authors. Another angle is offered by surveys of manuscripts that contain Arabic texts in Hebrew script. Studies of the first kind are easy to find in bibliographies on any important Jewish scholar (e.g., Saadia Gaon, Isaac Israeli, Maimonides). Studies of the two latter kinds include the following works (all contain bibliographies whose items are not reproduced here), arranged chronologically:

M. Steinschneider, *Die arabische Literatur der Juden. Ein Beitrag zur Literaturgeschichte der Araber, grössenteils aus handschriftlichen Quellen.* Frankfurt a.M.: J. Kauffmann, 1902.

Y. Tzvi Langermann, "Transcriptions of Arabic Treatises into the Hebrew Alphabet: An Underappreciated Mode of Transmission," pp. 247–60 in F. J. Ragep and P. S. Ragep, eds., *Tradition, Transmission: Transformation.* Leiden: Brill, 1996.

Haggai Ben-Shammai, "Kalâm in Medieval Jewish Philosophy," pp. 115–48 in Daniel H. Frank and Oliver Leaman, eds., *History of Jewish Philosophy.* London: Routledge, 1997.

Y. Tzvi Langermann, *The Jews and the Sciences in the Middle Ages.* Aldershot: Ashgate, 1999.

Rina Drory, *Models and Contacts. Arabic Literature and Its Impact on Medieval Jewish Culture.* Leiden: Brill, 2000.

Joel L. Kraemer, "The Islamic Context of Medieval Jewish Philosophy," pp. 38–68 in Daniel H. Frank and Oliver Leaman, eds., *The Cambridge Companion to Medieval Jewish Philosophy.* Cambridge: Cambridge University Press, 2003.

Raymond P. Scheindlin, "Merchants and Intellectuals, Rabbis and Poets," pp. 313–82 in David Biale, ed., *Cultures of the Jews.* New York: Schocken, 2003.

Mauro Zonta, "Influence of Arabic and Islamic Philosophy on Judaic Thought," in Edward N. Zalta, ed., *The Stanford Encyclopedia of Philosophy (Fall 2008 Edition).* Available at http://plato.stanford.edu/archives/fall2008/entries/arabic-islamic-judaic/

Sarah Stroumsa, "The Muslim Context," pp. 39–59 in Steven Nadler and T. M. Rudavsky, eds., *The Cambridge History of Jewish Philosophy. From Antiquity through the Seventeenth Century.* New York: Cambridge University Press, 2009.

CHRISTIAN EUROPE

Whereas Jews in the Islamic world adopted the majority language, Arabic, and were in close contact with its culture and science, nothing similar occurred in the Christian West before the fifteenth century. There Jewish scholars depended almost entirely on Hebrew translations for their acquaintance with non-Jewish bodies of knowledge. The transmission

[2] The question of why Jews wrote only belles lettres in Hebrew and used Arabic for the other genres has been raised here and there; some interesting insights are summarily and tantalizingly presented in Chaim Rabin, "Why Did Jews in Spain Not Translate into Hebrew, but Did So in Southern France?" *'Am wa-sefer* n.s. 5 (Summer 1989): 39–42 (Heb.).

of scientific and philosophical lore began in earnest with scholars such as Abraham Bar Ḥiyya (d. ca. 1136) and Abraham Ibn Ezra (1089–1167), whose works brought elements of Greco-Arabic profane knowledge into the ambit of the Hebrew-reading public. This first phase continued and expanded in the second half of the twelfth century, with the mass emigration of Jews pushed out of Spain by the Almohad persecutions. The new arrivals in the Midi included families of scholars – notably the Tibbonids and the Qimḥis – who launched a transfer of knowledge from Arabic into Hebrew. This process, which was to last for more than two centuries, began with translations of books of Jewish religious philosophy: Saadia's *Beliefs and Opinions*, Judah Halevi's *Kuzari*, Baḥya Ibn Paqudah's *Duties of the Hearts*, and Maimonides' *Guide of the Perplexed* are among the best known. It continued with works of science and philosophy by pagan and Muslim authors. A similar absorption of science and philosophy began in Italy in the second third of the thirteenth century. Along with the many translations from Arabic, some scientific and philosophical works were translated from Latin too – mainly in Italy. Medical literature was also translated into Hebrew, at first (in the twelfth to thirteenth centuries) mostly from Arabic, but later increasingly from Latin. These Hebrew translations of scientific and philosophical works were followed by the emergence of a blossoming scientific-philosophical culture in Provence and in the Italian peninsula.

This unprecedented and significant appropriation of science and philosophy reflected in Hebrew texts has been described in a number of works (again the order is chronological):

Moritz Steinschneider, *Die Hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893; repr. Graz, 1956). This monumental work is still the basis for all discussions. An English translation, *The Hebrew Translation Literature of the Middle Ages*, is in progress as a collaborative online project directed by Charles H. Manekin, with Y. Tzvi Langermann and H. H. Biesterfeldt.

Isadore Twersky, "Aspects of the Social and Cultural History of Provençal Jewry," *Journal of World History*, 11(1–2) (1968): 185–207.

A. S. Halkin, "Translation and Translators (Medieval)," *Encyclopedia Judaica* (1st ed., Jerusalem, 1972), 15: 1318–29.

Gad Freudenthal, "Les sciences dans les communautés juives médiévales de Provence: Leur appropriation, leur rôle," *Revue des études juives* **152** (1993): 29–136.

Gad Freudenthal, "Science in the Medieval Jewish Culture of Southern France," *History of Science* **33** (1995): 23–58; repr. in idem, *Science in the Medieval Hebrew and Arabic Traditions*. Aldershot: Ashgate, 2005.

Mauro Zonta, *La filosofia antica nel Medioevo ebraico*. Brescia: Paideia, 1996.

Giuliano Tamani and Mauro Zonta, *Aristoteles Hebraicus*. Venice: Supernova, 1997.

Y. Tzvi Langermann, *The Jews and the Sciences in the Middle Ages*. Aldershot: Ashgate, 1999.

Steven Harvey, "Arabic into Hebrew: The Hebrew Translation Movement and the Influence of Averroes upon Medieval Jewish Thought," pp. 258–80 in Daniel H. Frank and Oliver Leaman, eds., *The Cambridge Companion to Medieval Jewish Philosophy*. Cambridge: Cambridge University Press, 2003.

Gad Freudenthal, "The Introduction of Non-Rabbinic Learning into Provence in the Middle of the Twelfth Century: Two Sociological Patterns (Abraham Ibn Ezra and Judah Ibn Tibbon)," in S. Stroumsa and H. Ben-Shammai, eds., *Exchange and Transmission across Cultural Boundaries: Philosophy, Mysticism and Science in the Mediterranean World*. Jerusalem: Israel Academy of Science and Humanities, forthcoming.

Gad Freudenthal, "Arabic into Hebrew: Religious Polemics and the Accommodation of Secular Knowledge in Twelfth-Century Provençal Judaism," in David Freidenreich and Miriam Goldstein, eds., *Border Crossings: Interreligious Interaction and the Exchange of Ideas in the Islamic Middle Ages*. Philadelphia: University of Pennsylvania Press, 2011.

The two studies included in Part I of this volume complement the picture. In Chapter 2 Mauro Zonta offers the first chronological listing of the main Hebrew translations made during the medieval period: This listing provides insights into the historical process by which the corpus of Hebrew translations, so well depicted in Steinschneider's Die *Hebräischen Übersetzungen*, gradually came into being. Based on Zonta's list, I derived some statistics about the translated corpus, and in Chapter 3 I compare the shares of Hebrew translations from Arabic and from Latin. Most other chapters also include information on the reception by Hebrew-reading scholars of scientific lore in the disciplines they discuss.

2

Medieval Hebrew Translations of Philosophical and Scientific Texts

A Chronological Table

Mauro Zonta

What follows is a first attempt at a chronological table of Hebrew translations from Greek, Arabic, Judeo-Arabic, and Latin of medieval works of science and philosophy, made circa 1100–1500. The table includes both extant and lost translations and complete or partial ones, but generally excludes mere paraphrases, reworkings, commentaries on translated works, quotations from works, and compositions of dubious origin (if their "translated" character is uncertain). Here "science" covers physics, mathematics, astrology, and medicine as they were understood in the Middle Ages. It also includes works on grammar because they often contain explanations of philosophical and scientific terms. However, as a rule, it excludes pseudo-scientific texts (e.g., hermetical, magical, and alchemical works) and texts of a fundamentally religious character (e.g., a number of minor works by or attributed to Maimonides), although some include passages or arguments of philosophical interest. Usually the table supplies the Hebrew titles of the translations; in some cases, they could not be given or are placed in parentheses (when different titles appear in different manuscripts or when they were simply not transmitted by the manuscript tradition).

For most entries, short bibliographical data are given, listing major editions and important studies. Bibliographical references do not include these standard works: Moritz Steinschneider, *Die Hebraeischen Übersetzungen des Mittelalter*s (Berlin, 1893); E. Renan [and A. Neubauer], *Les Rabbins français du commencement du XIV^e siècle*, in *Histoire littéraire de la France*, Vol. XXVII (Paris, 1877), pp. 431–734; idem, *Les Écrivains juifs français du XIV^e siècle*, in *Histoire littéraire de la France*, Vol. XXXI (Paris, 1893), pp. 351–789 (where Provençal Hebrew translators of the period 1250–1350 are studied); nor do they include the relevant entries (if any) in the 1971 edition of the *Encyclopedia Judaica*.

A number of the references provided in the table are drawn from the following works, which have some bearing on partial or complete medieval Hebrew translations of Arabic or Latin philosophical and scientific texts; they are arranged chronologically:

- **C. Rigo**, "Egidio Romano nella cultura ebraica: le versioni di Yehudah b. Mosheh Romano," *Documenti e studi sulla tradizione filosofica medievale* 5 (1994): 397–437.

Acknowledgments. I am indebted to Gad Freudenthal, the editor of this volume, for his suggestion to prepare this table and for his advice on its arrangement. Prof. Charles M. Manekin kindly supplied the entries for logical works, for which I express my sincere gratitude. Further information on these works can be found in this volume's Chapter 5, "Logic in Medieval Jewish Culture," which he wrote. I am also very grateful to Gerrit Bos, Bernard R. Goldstein, Steven Harvey, Tony Lévy, Jean-Pierre Rothschild, and Shlomo Sela for their important observations and supplements to the chronological table.

- **C. Rigo**, "Yehudah ben Mosheh Romano traduttore degli Scolastici latini," *Henoch* 17 (1995): 141–70.
- **M. Zonta**, *La filosofia antica nel Medioevo ebraico* (Brescia, 1996); (see also **G. Tamani and M. Zonta**, *Aristoteles Hebraicus* [Venice, 1997], pp. 13–53).
- **T. Lévy**, "The Establishment of the Mathematical Bookshelf of the Medieval Hebrew Scholar: Translations and Translators," *Science in Context* 10 (1997): 431–51.
- **M. Zonta**, "The Autumn of Medieval Jewish Philosophy: Latin Scholasticism in Late 15th-Century Hebrew Philosophical Literature," pp. 474–92 in J. A. Aertsen and M. Pickavé, eds., *"Herbst des Mittelalters"? Fragen zur Bewertung des 14. und 15. Jahrhunderts* (Berlin: Walter de Gruyter, 2004).

The numerous and often extensive translations of Arabic texts preserved in the works of the thirteenth-century Spanish philosopher Shem Ṭov Ibn Falaquera are not included in the table. On his translations see M. Zonta, "Hebrew Transmission of Arabic Philosophy and Science: A Reconstruction of Shem Ṭov Ibn Falaquera's 'Arabic Library,'" pp. 121–37 in M. Perani, ed., *L'interculturalità dell'Ebraismo* (Ravenna: Longo Editore, 2004).

For Hebrew translations of medical works (mostly from Latin) made in the thirteenth, fourteenth, and fifteenth centuries, see L. Ferre, "Traducciones al hebreo de obras médicas en los s. XIII y XIV," *Miscelánea de estudios árabes y hebraicos* 33, no. 2 (1985–6): 61–74; idem, "Hebrew Translations from Medical Treatises of Montpellier," *Korot* 13 (1998–9): 21–36; L. García-Ballester, L. Ferre, and E. Feliu, "Jewish Appreciation of Fourteenth-Century Scholastic Medicine," *Osiris* (2nd series) 6 (1990): 85–117.

For Arabic-to-Hebrew translations of Judeo-Arabic works on Hebrew grammar, see Chapter 19 in this volume: Judith Olszowy-Schlanger, "The Science of Language among Medieval Jews." It is my main source for this discipline.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
1	after 956 (and before 1140)	Dunash ben Tamim, *Commentary on the Book of Creation* (1)	(פרוש על ספר יצירה)	Arabic	Anonymous	?[1]
2	ca. 1050–75	Judah ben David Ḥayyuj, *Book of Hollow Verbs* and *Book of Reduplicated Verbs* (1)	ספר אותיות הנוח, ספר פעלי הכפל	Arabic	Moses ha-Kohen Ibn Gikatilla	Spain (Saragossa?)[2]
3	12th cent.	Abu l-Faraj Harun, *Guidance to the Reading (of the Bible)* (1)	הוראות הקורא	Arabic	Anonymous	Germany (Mainz)[3]
4	12th cent.	Abu l-Faraj Harun, *Guidance to the Reading (of the Bible)* (2)	טעמי המקרא	Arabic	Anonymous	Italy[4]
5	12th cent.?	Dunash ben Tamim, *Commentary on the Book of Creation* (2)	פרוש על ספר יצירה	Arabic	Anonymous	?[5]
6	first decades of the 12th cent.	Saadia Gaon, *Commentary on the Book of Creation* (1)	(פרוש על ספר יצירה)	Arabic	Anonymous	Spain?[6]
7	before 1136	Muḥammad Ibn Jābir al-Battani, *Tables*	ספר חשבון מהלכות הכוכבים	Arabic	Abraham bar Ḥiyya	Spain (Barcelona?)[7]

[1] See P. B. Fenton, "Introduction," and G. Vajda, in idem, *Le Commentaire sur le Livre de la Création de Dunas ben Tamim de Kairouan (Xe siècle)*, ed. P. B. Fenton (Paris and Louvain, 2002), pp. 10, 23–32, and 171–5.

[2] Ed. J. W. Nutt, *Two Treatises on Verbs Containing Feeble and Double Letters by Jehuda Hayyug of Fez, Translated into Hebrew from the Original Arabic by R. Moses Gikatilia of Cordoba*. . . (London and Berlin 1870). See also J. Martinez Delgado, "Moshe ben Shemuel ha-Kohen ibn Chiquitilla, el traductor," *Miscelánea de Estudios Árabes y Hebraicos, sección hebrea* 51 (2002): 119–57.

[3] Ed. G. Busi, *Horayat ha-qore'. Una grammatica ebraica del secolo X* (Frankfurt a.M., 1984). The name of the real author of this book was discovered by I. Eldar. See I. Eldar, "Mukhtasar (an abridgment) of Hidāyat al-qāri: A grammatical treatise discovered in the Genizah," in J. Blau and S. C. Reif, eds., *Genizah Research after Ninety Years: The Case of Judaeo-Arabic* (Cambridge, 1992), pp. 67–73.

[4] Ed. I. Mercerus, *Liber de accentibus Scripturae auctore R. Iuda filio Balaam* . . . (Paris, 1565); see also W. Wickes, *A Treatise on the Accentuation of the Three So-Called Poetical Books of the Old Testament* (Oxford, 1881).

[5] Ed. M. Grossberg, *Sefer Yeṣirah ʿim peruš Abuzahl Dunaš ben Tamim* (London, 1902).

[6] See Yehudah ben Barzilai, *Perush sefer yeṣirah*, ed. Z. H. Halberstam (Berlin, 1885), pp. 268–78, where the extant quotations of the translation (probably incomplete) made by Yehudah ben Barzilai himself are published.

[7] See J. M. Millás Vallicrosa, *La obra Séfer Heshbón mahelakot ha-kokabim de R. Abraham Bar Hiyya ha-Bargeloni* (Barcelona, 1959). The canons (instructions) for the tables are by Bar Ḥiyya himself, although most of the tables were taken directly from al-Battani (see pp. 112ff.). Hence it is rather a partial and often paraphrastic translation of al-Battani's work.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
8	1140–42	Judah ben David Ḥayyuj, *Book of Vocalization, Book of Hollow Verbs,* and *Book of Reduplicated Verbs* (2)	ספר אותיות הנוח, ספר פעלי הכפל, ספר הנקוד	Arabic	Abraham Ibn Ezra	Italy (Rome)[8]
9	mid-12th cent.	Masha'allah, *Book on Lunar and Solar Eclipses*	ספר בקדרות הלבנה והשמש	Arabic	Anonymous	?[9]
10	mid-12th cent.	Masha'allah, *Book of Interrogations*	ספר השאלות	Arabic	Anonymous	?
11	mid-12th cent.	al-Fārābī, *On the Intellect* (1)	כתב הדעת	Arabic	Anonymous	Provence[10]
12	1160	Aḥmad Ibn al-Muthanna, *Commentary on al-Khwarizmi's Astronomical Tables* (1)	טעמי לוחות אלמות'אני	Arabic	Abraham Ibn Ezra	England (London?)[11]
13	after 1160 (and before 1270)	Aristotle, *De anima*, old Latin translation, part of chapter 1 (1150–60)		Latin	Anonymous	Spain[12]
14	after ca. 1160 (and before 1270?)	Dominicus Gundisalvus, *On the Soul*	ספר הנפש	Latin	Anonymous (same as previous translation)	Spain[13]
15	1161	Baḥya Ibn Paqudah, *The Duties of the Hearts* (1)	חובות הלבבות	Arabic	Judah Ibn Tibbon	Provence (Lunel)[14]
16	1167	Judah ha-Levi, *Book of the Khazar* (1)	ספר הכוזרי	Arabic	Judah Ibn Tibbon	Provence (Lunel)[15]
17	1167	Solomon Ibn Gabirol, *The Correction of the Soul's Dispositions*	תקון מדות הנפש	Arabic	Judah Ibn Tibbon	Provence (Lunel)[16]
18	before 1167	Judah ha-Levi, *Book of the Khazar* (2)		Arabic	Judah Ibn Cardinal	Spain[17]

19	before 1170	Baḥya Ibn Paqudah, *The Duties of the Hearts* (2)		Arabic	Joseph Qimḥi	Narbonne?[18]
20	ca. 1170	Moses Ibn Ezra, *The Treatise of the Garden*, part I (perhaps including the entire book)	ערוגת הבושם	Arabic	Judah al-Ḥarizi	Provence[19]
21	ca. 1170	Jonah Ibn Janaḥ, *Book of Admonition*	ספר ההארה	Arabic	Judah Ibn Tibbon	Provence (Lunel)
22	before 1171	Jonah Ibn Janaḥ, *Book of Roots* (1), as far as *lamed*	ספר השורשים	Arabic	Isaac ben Judah of Barcelona	Spain (Barcelona)?[20]
23	before 1171	Jonah Ibn Janaḥ, *Book of Roots* (2), as far as *lamed*	(ספר השורשים?)	Arabic	Isaac ha-Levi (lost version)	?

[8] Ed. L. Dukes, *Grammatische Werke des R. Jehuda Chajjug aus Fez* (Stuttgart, 1844). About the date and place of it, see S. Sela and G. Freudenthal, "Abraham Ibn Ezra's Scholarly Writings: A Chronological Listing," *Aleph* 6 (2006): 13–55, on pp. 18 and 24.

[9] See B. R. Goldstein, "The Book on Eclipses of Masha'allah," *Physics* 6 (1964): 205–13. Abraham Ibn Ezra's supposed authorship of this translation has been rejected by S. Sela ("Abraham Ibn Ezra's Special Strategy in the Creation of a Hebrew Scientific Terminology," *Micrologus* 9 [2001]: 65–87, on p. 68 n. 1).

[10] For this translation (actually a redaction, under the title *Ketav ha-da'at*), see G. Freudenthal's study and critical edition, "*Ketav ha-da'at* or *Sefer ha-sekhel we-ha-muskalot*: The Medieval Hebrew Translations of Al-Farabi's *Risalah fi'l-'Aql*. A study in the text history and in the evolution of medieval Hebrew philosophical terminology," *Jewish Quarterly Review* 93 (2002): 29–115.

[11] Ed. B. R. Goldstein, *Ibn al-Muthanna's Commentary on the Astronomical Tables of al-Khwarizmi: Two Hebrew Versions* (New Haven and London, 1967).

[12] See J. L. Teicher, "The Latin-Hebrew School of Translators in Spain in the Twelfth Century," pp. 403–44 in *Homenaje a Millas-Vallicrosa* 2 (Barcelona, 1956), on pp. 409–14; Zonta, *La filosofia antica*, pp. 193–5.

[13] See Teicher, "The Latin-Hebrew School of Translators."

[14] First ed. Naples 1489.

[15] First ed. Fano 1506. The real title of the Arabic text was *Book of Proof and Argument in Defense of the Despised Faith.*

[16] First ed. Constantinople 1550.

[17] The only extant part of this translation is to be found in D. Cassel, ed., *Das Buch Kusari des Jehuda ha-Levi* (Leipzig, 1869), pp. 344–61. See also I. Sonne, "Ein Beitrag zur der verschollenen Kuzariuebersetzug des Jehuda ben Cardinal," *Monatschrift für Geschichte und Wissenschaft des Judentums* 72 (1928): 66–70.

[18] The only extant fragment of this translation (part of chapter 7 of the work) was first edited by Adolf Jellinek in I. Benjacob, ed., *Baḥya Ibn Paqudah, Sefer Ḥovot ha-levavot* (Leipzig, 1846), pp. xx ff.

[19] The extant parts of this translation were edited by L. Dukes, "Passages from the Book *'Arugat ha-bosem* (*Bed of Perfume*) by Rabbi Moses ben Ezra" (in Hebrew), *Zion* 2 (1842): 117–23, 134–7, 157–60, 175. See also P. B. Fenton, *Philosophie et exégèse dans "Le jardin de la métaphore" de Moise Ibn 'Ezra, philosophe et poète andalou du XIIe siècle* (Leiden, 1997).

[20] According to M. Perani (see www.morasha.it/zehut/mp06_italian_ghenizah.html), this version may be identical with a recently discovered anonymous version of the *Book of Roots*, about which see B. Richler, "A New Translation of *Sefer ha-Shorashim* by R. Yonah Ibn Janah" (in Hebrew), *Qiryat Sefer* 63 (1990–1): 993–5; idem, "New Manuscript Fragments from the Unknown Translation of *Sefer ha-Shorashim* by R. Yonah Ibn Janah" (in Hebrew), *Qiryat Sefer* 63 (1990–1): 1327–8. See M. Perani, "I manoscritti ebraici della 'Genizah' italiana. Frammenti di una traduzione sconosciuta del *Sefer ha-shorashim* di Yonah Ibn Janah," *Sefarad* 53 (1993): 103–42.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
24	before 1171	Jonah Ibn Janaḥ, *Book of Variegated Flower-Beds*	ספר הרקמה	Arabic	Judah Ibn Tibbon	Provence (Lunel)[21]
25	1171	Jonah Ibn Janaḥ, *Book of Roots* (3)	ספר השורשים	Arabic	Judah Ibn Tibbon	Provence (Lunel)[22]
26	1180–1200?	Ibn al-Sid al-Batalyawsi, *Book of the Intellectual Spheres* (1)	(ספר העגולות הרעיוניות)	Arabic	Solomon Ibn Daud	Spain[23]
27	1180–1200?	Averroes, *Generalities of Medicine (Kulliyyat)* (1)	מכלל	Arabic	Solomon Ibn Daud	Spain
28	1186	Saadia Gaon, *Book of the Beliefs and Opinions*	ספר האמונות והדעות	Arabic	Judah Ibn Tibbon	Provence[24]
29	after 1187?	Gerardus Cremonensis, *On Urines*	מראות השתנים	Latin	Anonymous	?
30	1197–9	Galen, *The Art of Medicine*, Arabic trans. by Ḥunayn Ibn Isḥaq, Latin trans.	המאסף לכל המחנות	Latin	"Do'eg ha-'Edomi" (pseud.)	Provence
31	1197–9	Hippocrates, *Prognostics with Galen's Commentary*, Arabic trans. by Ḥunayn Ibn Isḥaq, Latin trans. by Gerardus Cremonensis	חידות והשגחות	Latin	"Do'eg ha-'Edomi" (pseud.)	Provence
32	1197–9	Ḥunayn Ibn Isḥaq, *Introduction to Galen's Commentary on Hippocrates' Aphorisms*, Latin trans. by Constantinus Africanus	אגור	Latin	"Do'eg ha-'Edomi" (pseud.)	Provence[25]
33	1197–9	Ḥunayn Ibn Isḥaq, *Introduction to Galen's Art of Medicine*, Latin trans. by Constantinus Africanus	בדק הבית	Latin	"Do'eg ha-'Edomi" (pseud.)	Provence
34	1197–9	ʿAli ben al-ʿAbbas al-Majusi, *The Complete Art (of Medicine)*, Latin trans.	שלם המלאכה הרפואית	Latin	"Do'eg ha-'Edomi" (pseud.)	Provence[26]
35	1197–9	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *(Medical) Assistance*, Latin trans. by Constantinus Africanus	ספר המעלות	Latin	"Do'eg ha-'Edomi" (pseud.)	Provence

36	1197–9	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *Provisions for the Traveler* (1), Latin trans. by Constantinus Africanus	יאיר נתיב	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
37	1197–9	Isaac Israeli, *Book on Particular Diets*, Latin trans. by Constantinus Africanus	ספר המסעדים	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
38	1197–9	Isaac Israeli, *Book on Urines* (1), Latin trans. by Costantinus Africanus	מראות השתן	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
39	1197–9	Isaac Israeli, *Book on Fevers* (1), Latin trans. by Costantinus Africanus	ספר הקדחות (?)	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
40	1197–9	Constantinus Africanus, *Perfection of the Nature and the Temperament*	השלמת הטבע והמזג	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
41	1197–9	Gerardus Cremonensis, *The Way of Medical Treatment*	הכבושים והטהרות הגופיות	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
42	1197–9	Nicholas Praepositus, *Prescriptions (Antidotarium)* (1)	הריקוח הקטן	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence[27]
43	1197–9	Theophilus "Philaretus," *On Pulses* and *On Urines*	ספר הדפק, ספר השתן	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence
44	1197–9	Pseudo-Galen, *On the Passions of Women*, version B	ספר האם	Latin	"Doʾeg ha-ʾEdomi" (pseud.)	Provence[28]

[21] Ed. M. Wilensky, *R. Yonah Ibn Janah, Kitab al-lumaʿ, Sefer ha-riqmah, be-targumo ha-ʿivri šel Yehudah Ibn Tibbon* (Berlin, 1929–1931); second ed., rev. D. Tene (Jerusalem, 1964).

[22] Ed. W. Bacher, *Sefer ha-Šorašim . . . ḥibbero bi-lšon ʿarav R. Yonah ben Janah, we-heʿtiqo ʾel lešon ha-qodeš R. Yehudah Ibn Tibbon* (Berlin, 1896).

[23] Identified by B. Richler, "Identification of the Anonymous Translation of the *Book of the Intellectual Spheres*" (in Hebrew), *Qiryat Sefer* 53 (1978): 577.

[24] First ed. Constantinople 1562. A first Arabic-into-Hebrew "translation" (in reality, a paraphrase) of Saadia's book was made before 1096: see R. C. Kiener, "The Hebrew Paraphrase of Saadiah Gaon's *Kitāb al-Amanāt wa'l-Iʿtiqādāt*," *AJS Review* 11 (1986): 1–25.

[25] See L. Ferre, "The Medical Work of Hunayn ben Ishaq (Johannitius) in Hebrew Translation," *Korot* 11 (1995): 42–53.

[26] See R. Barkai, "The Hebrew and Judaeo-Arabic Versions of al-Majusi," pp. 42–64 in C. Burnett and D. Jacquart, eds., *Constantine the African and ʿAli Ibn al-ʿAbbas al-Majusi* (Leiden, 1994).

[27] According to M. Steinschneider, there are between two and four Hebrew translations, with different redactions, of Nicholas's *Prescriptions (Antidotarium)*. Except for one case, however (below, a translation possibly made in 1280–1300), he seems to have not clearly distinguished them and simply gives a list of the extant manuscripts, pointing out their differences. See M. Steinschneider, *Die hebraeischen Übersetzungen des Mittelalters* (Berlin, 1893), pp. 811–16.

[28] Ed. and trans. into English by R. Barkai, *A History of Jewish Gynaecological Texts in the Middle Ages* (Leiden, 1998), pp. 145–80.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
45	1197–9	Trotula Salernitanus, *On the Conditions of Women*, version 3	ספר הסתר	Latin	“Do’eg ha-’Edomi” (pseud.)	Provence[29]
46	1197–9?	Johannes Platearius senior and others (collection of quotations), *Practical Medicine*	ספר העזר	Latin	“Do’eg ha-’Edomi” (pseud.)?	Provence?
47	1199	ʿAli Ibn Ridwan, *Commentary on Galen’s Art of Medicine*	פירוש מלאכה קטנה	Arabic	Samuel Ibn Tibbon	Provence (Béziers)
48	Before 1200?	Al-Fārābī, *Sophistics*	ספסטניא	Arabic	Anonymous	Spain?[30]
49	Before 1200?	Al-Fārābī, *Treatise on the Conditions of the Demonstrative Syllogism*	מאמר בתנאי ההקש המופתי	Arabic	Anonymous (Judah Ibn Tibbon?)	Provence?
50	ca. 1200	Averroes, two *Epistles on the Possibility of the Conjunction with the Active Intellect*	אגרת אפשרות הדבקות בשכל הפועל; אגרת אפשרות הדבקות הקצר	Arabic	Samuel Ibn Tibbon	Provence[31]
51	ca. 1200	Averroes Junior, *On Whether the Active Intellect Unites with the Material Intellect*	מאמר אחר לבנו (= לבן רשד) בזה הענין	Arabic	Samuel Ibn Tibbon	Provence[32]
52	ca. 1200?	Jonah Ibn Janaḥ, *The Book of Adjustment*	ספר ההשואה	Arabic	Solomon ben Joseph Ibn Ayyub	Provence (Béziers)[33]
53	ca. 1200?	Jonah Ibn Janaḥ, *Book of Criticism*	ספר ההשגה	Arabic	Obadiah ben Samuel ha-Sefaradi	Northern France[34]
54	ca. 1200?	Pseudo-Aristotle, *Moral Epistle*	אגרת המוסר	Arabic	Judah al-Ḥarizi	Provence?[35]
55	ca. 1200?	Pseudo-Galen, *Book on the Ban of Burying, Compendium by Abu Sayyid ʿUbaydallah*	ספר איסור הקבורה לגלינוס קיצור ישוע האשורי	Arabic	Judah al-Ḥarizi	Provence?
56	Around 1200	Saadia Gaon, *Commentary on the Book of Creation* (2)	פרוש על ספר יצירה	Arabic	Moses ha-Dayyan	Spain (Lucena?)[36]
57	Around 1200	Dunash ben Tamim, *Commentary on the Book of Creation* (3)	פרוש לספר יצירה	Arabic	Moses ha-Dayyan	Spain (Lucena?)[37]

58	1200–50	Al-Fārābī, *Introductory Epistle on Logic* (1)	אגרת אבי ישע אלפאראבי בהצעה למלאכת ההגיון	Arabic	Anonymous	Spain or Provence?
59	1200–50	Al-Fārābī, *Introductory Epistle on Logic* (2)	אגרת אבו נצר אלפאראבי בפתיחת מלאכת ההגיון	Arabic	Anonymous	Spain or Provence?
60	1200–50	Al-Fārābī, *Introductory Epistle on Logic* (3)	פרקים בהישרה להגיון	Arabic	Anonymous	Spain or Provence?
61	1200–50	Al-Fārābī, *Chapters on Logic* (1)	אלה הם הפרקים . . . במלאכת הגיון	Arabic	Anonymous	Spain or Provence
62	1200–50	Al-Fārābī, *Chapters on Logic* (2)	פרקים כוללים . . . באומנות הדבר	Arabic	Moses Ibn Lanis (Lajis/Lijas)	Spain or Provence?
63	1200–50	Al-Fārābī, *Chapters on Logic* (3)	פרקים ישלמו . . . במלאכת ההגיון	Arabic	Anonymous	Spain or Provence?
64	1200–50	Al-Fārābī, *Chapters on Logic* (4)	פרקים שיש בהם קבוץ כל העניינים שיצטרך אל ידיעתם המתחיל בחכמת הדבור. . . .	Arabic	Anonymous	Spain or Provence
65	1200–50	Al-Fārābī, *Treatise on the Isagoge* (1)	מבוא	Arabic	Anonymous	Spain or Provence?
66	1200–50	Al-Fārābī, *Treatise on the Isagoge* (2)	קצור אחר . . . המבוא	Arabic	Moses Ibn Lanis (Lajis/Lijas?)	Spain or Provence?
67	1200–50	Al-Fārābī, *Treatise on the Isagoge* (3)	איסאגוגי	Arabic	Anonymous	Spain or Provence?
68	1200–50	Al-Fārābī, *Treatise on the Categories* (1)	קטיקוריאס . . . ספר המאמרות	Arabic	Anonymous	Spain or Provence?

29 Ed. and trans. into English by Barkai, ibid., pp. 181–91. About the Hebrew tradition of the so-called *Trotula* works, see C. Caballero Navas, "Algunos *secretos de mujeres* revelados. El *Se'ar yasub* y la recepción y transmisión del *Trotula* en hebreo," *Miscelánea de estudios árabes y hebraicos, sección hebrea* 55 (2006): 381–425.

30 The following breakdown of the translations of Al-Farabi's logical writings is preliminary and based, to a large extent, on Zonta, *La filosofia antica*, pp. 189–93 (where the conclusions are also called preliminary). The manuscripts represent two, three, or four versions of the same work.

31 Ed. with Moses Narboni's commentary by K. P. Bland, *Ibn Rushd, The Epistle on the Possibility of Conjunction with the Active Intellect, with the Commentary of Moses Narboni* (New York, 1982).

32 Ed. M. Zonta. See C. Burnett and M. Zonta, "Abu Muhammad ʿAbd Allah Ibn Rushd (Averroes Junior): On Whether the Active Intellect Unites with the Material Intellect whilst It Is Clothed with the Body," *Archives d'histoire doctrinale et littéraire du Moyen Age* 67 (2000): 295–335, on pp. 308–15.

33 Ed. J. M. Camacho Padilla, *Rabí Yonâ ben Gannach. La secunda mitad del "Sefer Hahaxua," versión hebraica de su Kitâb al-Taswiya por Salomón bar Yosef ben Ayyub* (Cordova, 1929) (fragments only).

34 Ed. D. Tene, *Sefer ha-Haśśagah, hu' Kitab al-mustaḥlaq, le-R. Yonah Ibn Janaḥ, be-targumo ha-ʿivri šel ʿOvadiyyah ha-Sefaradi* (Jerusalem, 2006).

35 Ed. J. Marcaria, *Aristoteles, 'Iggeret ha-musar ha-kelalit* (Riva di Trento, 1559).

36 First ed. *Sefer Yeṣirah ʿim ḥamiššah perušim: . . . rav Saʿadyah Ga'on* . . . (Grodno, 1796).

37 Ed. P. B. Fenton, in Vajda, *Le Commentaire sur le Livre de la Création de Dunas ben Tamim*, pp. 212–48.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
69	1200–50	Al-Fārābī, *Treatise on the Categories* (2)	קטיקוריאס . . . ספר המאמרות	Arabic	Anonymous	Spain or Provence?
70	1200–50	Al-Fārābī, *Treatise on the Categories* (3)	קטיקוריאס . . . ספר המאמרות	Arabic	Anonymous	Spain or Provence?
71	1200–50	Al-Fārābī, *Treatise on De interpretatione* (1)	ביריאמיננאס . . . ספר המליצה	Arabic	Anonymous	Spain or Provence?
72	1200–50	Al-Fārābī, *Treatise on De interpretatione* (2)	ביריאמיננאס . . . ספר המליצה	Arabic	Anonymous	Spain or Provence?
73	1200–50	Al-Fārābī, *Treatise on De interpretatione* (3)	ביריאמיננאס . . . ספר המליצה	Arabic	Anonymous	Spain or Provence?
74	1200–50	Al-Fārābī, *Treatise on the Prior Analytics* (1)	ההיקש	Arabic	Anonymous	Spain or Provence?
75	1200–50	Al-Fārābī, *Treatise on the Prior Analytics* (2)	ההיקש	Arabic	Anonymous	Spain or Provence?
76	1200–50	Al-Fārābī, *Treatise on the Topics* (1)	אומנות הניצוח	Arabic	Anonymous	Spain or Provence?
77	1200–50	Al-Fārābī, *Treatise on the Topics* (2)	אומנות הניצוח	Arabic	Anonymous	Spain or Provence?
78	1200–50	Al-Fārābī, *Treatise on the Sophistics*	הטעאה	Arabic	Anonymous	Spain or Provence
79	1200–50	Al-Fārābī, *Long Commentary on the Categories* (or perhaps, *Long Commentary on Some Obscure Points of the Categories*)	"אגרת או פרק נפרד כנהו בשם תרצה"	Arabic	Anonymous	Spain or Provence[38]
80	1200–50	Al-Fārābī, *Long Commentary on De interpretatione*	פרוש על ספר המליצה	Arabic	Anonymous	Spain or Provence[39]
81	after 1200?	Anonymous, *Short Treatise on the Asymptotic Property of the Hyperbola*		Arabic	Two anonymous translations	?[40]
82	13th cent.?	Abu Ḥamid al-Ghazali, *The Lamps of Lights* (1)	משכית האורות	Arabic	Isaac ben Joseph al-Fasi	Spain
83	13th cent.?	Abu Ḥamid al-Ghazali, *The Lamps of Lights* (2)	מאורות אלוהיות	Arabic	Anonymous	?

84	13th cent.?	Joseph Ibn Ṣaddiq, *The Book of Microcosm*	ספר עולם קטן	Arabic	Anonymous (Naḥum ha-Maʿaravi?)	Spain?[41]
85	13th cent.?	Isaac Israeli, *The Book of Definitions* (1)	חיבור יצחק הישראלי, והוא ספר ההגדרות	Arabic	Anonymous	Spain?[42]
86	13th cent.?	Pseudo-Aristotle (Isaac Israeli), *On the Elements*	שער היסודות	Arabic	Anonymous	?[43]
87	13th cent.?	Isaac Israeli, *Book of Spirit and Soul*	ספר הרוח והנפש	Arabic	Anonymous	?[44]
88	13th cent.?	Al-Fārābī, *On the Intellect* (2)	מאמר השכל והמושכלות	Arabic	Anonymous	Provence?[45]
89	13th cent.?	Aḥmad Ibn al-Muthanna, *Commentary on al-Khwarizmi's Astronomical Tables* (2)	טעמי לוחות אלכוארזמי	Arabic	Anonymous	?[46]
90	13th cent.?	Pseudo-Macer Floridus (Odo de Meudon), *On the Virtues of Herbs* (fragment)		Latin and Occitanian	Anonymous	Provence[47]
91	13th cent.?	Averroes, *Generalities of Medicine (Kulliyyat)* (2)	ספר הכולל ברפואה	Arabic	Anonymous	Spain?
92	13th cent.?	Averroes, *Treatise on the Theriac*	מאמר בתריאק	Arabic	Anonymous	?
93	13th cent.?	Averroes, *Simple (Medicines) for the Cure of the Illnesses of the Body*	פשוטים ברפואת חולי הגוף	Arabic	Anonymous	?

[38] Ed. M. Zonta, "Al-Fārābī's *Long Commentary* on Aristotle's *Categoriae* in Hebrew and Arabic: A Critical Edition and English Translation of the Newly-Found Extant Fragments," *Studies in Arabic and Islamic Culture* 2 (2006): 185–254.

[39] Ibid., p. 224.

[40] See: Lévy, "The Establishment," p. 438; G. Freudenthal, "Maimonides' *Guide of the Perplexed* and the Transmission of the Mathematical Tract 'On Two Asymptotic Lines' in the Arabic, Latin, and Hebrew Medieval Traditions," *Vivarium* 26 (1988): 113–40; see also T. Lévy, "L'étude des sections coniques dans la tradition médiévale hébraïque. Ses relations avec les traditions arabe et latine," *Revue d'histoire des sciences* 42 (1989): 193–239, on pp. 197–209.

[41] Ed. A. Jellinek, *ʿOlam Qatan. Der Mikrokosmus. Ein Beitrag zur Religionsphilosophie und Ethik von R. Josef ibn Zaddik* (Leipzig, 1854); and by S. Horowitz, *Der Mikrokosmos der Josef Ibn Saddik* (Breslau, 1903); English trans. (including Horowitz's ed.) in J. Haberman, *The Microcosm of Joseph Ibn Saddiq* (Madison and London, 2003).

[42] Only some fragments of this translation are extant; they were published by A. Altmann, "Isaac Israeli's *Book of Definitions*: Some Fragments of a Second Hebrew Translation," *Journal of Semitic Studies* 2 (1957): 232–42.

[43] Ed. A. Altmann, "Isaac Israeli's Chapter on the Elements (MS. Mantua)," *Journal of Jewish Studies* 7 (1956–7): 31–57.

[44] Ed. M. Steinschneider, ["The Hebrew Translation of Isaac Israeli's *Book on Spirit and Soul*" (in Hebrew)], *Ha-Karmel* 1 (1871–2): 400–5.

[45] Ed. M. Rosenstein, *Maʾamar ha-sekel we-ha-muskalot* (Bratislava, n.d. [1858?]; repr. in J. Klatzkin, *ʾOṣar ha-munaḥim ha-filosofiyyim we-ʾantologiyah filosofit*, Vol. 1: *ʾAntologiyah šel ha-filosofiyah ha-ʿivrit* (Berlin, 1926), pp. 221–31.

[46] Ed. Goldstein, *Ibn Muthanna's Commentary*. According to Sela, "Abraham Ibn Ezra's Special Strategy," this translation is not by Ibn Ezra, as is commonly supposed.

[47] Ed. G. Bos and G. Mensching, "Macer Floridus: A Middle Hebrew Fragment with Romance Elements," *Jewish Quarterly Review* 91 (2000): 17–51.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
94	13th cent.?	Isaac Israeli, *Book on Fevers* (2)	ספר מחובר מדברי הראשונים בקדחות	Arabic	Anonymous	Spain or Provence?
95	13th cent.?	Moses Maimonides, *On Hemorrhoids* (1)	מאמר ברפואת הטחורים	Arabic	Anonymous	?[48]
96	13th cent.?	Moses Maimonides, *On Sexual Intercourse* (1)	מאמר המשגל	Arabic	Anonymous	?[49]
97	13th cent.?	Moses Maimonides, *On Asthma* (1)	(ספר הקצרת)	Arabic	Anonymous	?[50]
98	13th cent.?	Judah ben Samuel Ibn Balʿam, *Book of Homonyms, On Hebrew Particles*, and *On Denominative Verbs*	טעמי המקרא, ספר האותיות, הפעלים	Arabic	Anonymous	?[51]
99	13th cent.?	Abu Bakr al-Razi, *The Aided Doctor* (*al-Mansuri*) (1), Latin trans. by Gerardus Cremonensis (parts)	אלמנסור	Latin	Anonymous	Spain or Provence?
100	1204	Moses Maimonides, *The Guide of the Perplexed* (1)	מורה הנבוכים	Arabic	Samuel Ibn Tibbon	Provence (Arles)[52]
101	ca. 1205–13	Moses Maimonides, *The Guide of the Perplexed* (2)	מורה הנבוכים	Arabic	Judah al-Ḥarizi	Provence[53]
102	1210	Aristotle, *Meteorologica*, Arabic trans. by Yaḥya Ibn al-Biṭriq	אותות השמים	Arabic	Samuel Ibn Tibbon	Provence (but while Ibn Tibbon was sailing in the Mediterranean)[54]
103	ca. 1210–30	Pseudo-Aristotle, *Book of the Apple*	ספר התפוח	Arabic	Abraham Ibn Ḥasdai	Spain[55]
104	ca. 1210–30	Abu Ḥamid al-Ghazali, *The Balance of Actions*	מאזני צדק	Arabic	Abraham Ibn Ḥasdai	Spain[56]
105	ca. 1210–30	Isaac Israeli, *Book of the Elements* (1)	ספר היסודות	Arabic	Abraham Ibn Ḥasdai	Spain[57]
106	after ca. 1210–30	Isaac Israeli, *Book of the Elements* (2)	ספר היסודות	Arabic	Anonymous	?[58]
107	ca. 1216–18	Ḥunayn Ibn Isḥaq, *Opinions of the Philosophers*	מוסרי הפילוסופים	Arabic	Judah al-Ḥarizi	Provence[59]
108	ca. 1230	Euclid, *Elements*, Arabic trans. by al-Ḥajjaj Ibn Yusuf and Isḥaq Ibn Ḥunayn, revised by Thabit Ibn Qurra (1)	ספר אקלידוס	Arabic	Jacob Anatoli?	Italy (Naples?)[60]

109	1231–5	Ptolemy, *The Almagest*, Arabic translations by al-Ḥajjaj Ibn Yusuf and Isḥaq Ibn Ḥunayn, compared to the Latin translation by Gerardus Cremonensis	החיבור הגדול הנקרא אלמגסטי	Arabic and Latin	Jacob Anatoli	Italy (Naples?)[61]
110	1231–5	Abu l-ʿAbbas Aḥmad al-Farghani, *The Elements of Astronomy* (Arabic text, compared to the Latin translation by Gerardus Cremonensis)	אלפרגאני (יסודות התכונה)	Arabic and Latin	Jacob Anatoli	Italy (Naples)[62]
111	1231–5	Averroes, *Compendium of Ptolemy's Almagest*	קיצור אלמגסטי	Arabic	Jacob Anatoli	Italy (Naples?)[63]
112	1231–5?	Thabit Ibn Qurra, *Explanation of Ptolemy's Almagest*		Arabic	Anonymous	?[64]
113	1232	Averroes, *Middle Commentary on the Isagoge*	הבאור האמצעי למבוא	Arabic	Jacob Anatoli	Naples[65]
114	1232	Averroes, *Middle Commentary on the Categories*	הבאור האמצעי למאמרות	Arabic	Jacob Anatoli	Naples[65]

48 Ed. S. Muentner, *Rabbenu Mošeh ben Maimon, Bi-refu'at ha-ṭehorim, Ma'amar ʿal-ḥizzuq koaḥ ha-gavra'* (Jerusalem, 1965).
49 Ed. H. Kroner, *Ein Beitrag zur Geschichte der Medizin des XII. Jahrhunderts an der Hand zweier medizinischer Abhandlungen des Maimonides* (Oberdorf, 1906).
50 Ed. G. Bos, *Maimonides On Asthma* (Provo, 2008), 2: 387–448.
51 Critical ed. in S. Abramson, *Šelošah sefarim šel R. Yehudah ben Balʿam, maqor we-targum le-ʿivrit* (Jerusalem, 1975).
52 First ed. in Italy, 1473–4.
53 Ed. L. Schlossberg, *Sefer Moreh nevukim*, 3 vols. (London, 1851–79).
54 Ed. and trans. into English by R. Fontaine, *Otot ha-shamayim: Samuel Ibn Tibbon's Hebrew Version of Aristotle's Meteorology* (Leiden, 1995).
55 First ed. Venice 1519.
56 Ed. J. Goldenthal, *Mizan al-ʿamal, sive Compendium doctrinae ethicae, auctore Al-Gazali* . . . (Leipzig, 1839).
57 Ed. S. Fried, *Sefer ha-Yesodot. Das Buch über die Elemente . . . von Isaak ben Salomon Israeli* (Frankfurt a.M., 1900).
58 Ibid., pp. 75–83, where this translation is ascribed to Moses Ibn Tibbon.
59 Ed. A. Loewenthal, *Sefer Musre ha-philosophim ('Sinnsprueche der Philosophen'), aus dem Arabischen des Honein ibn Ishak ins Hebräische übersetzt* . . . (Frankfurt a.M., 1896).
60 See Lévy, "The Establishment," p. 433; idem, "Une version hébraïque inédite des *Eléments* d'Euclide," pp. 181–239 in D. Jacquart, ed., *Les voies de la science grecque* (Geneva, 1997).
61 See M. Zonta, "La tradizione ebraica dell'*Almagesto* di Tolomeo," *Henoch* 15 (1993): 325–50.
62 See R. Campani, "Il *Kitab al-Farghani* nel testo arabo e nelle versioni," *Rivista degli Studi Orientali* 3 (1910): 205–52.
63 See J. Lay, "L'*Abrégé de l'Almageste*. Un inédit d'Averroès en version hébraïque," *Arabic Sciences and Philosophy* 6 (1996): 23–61.
64 I owe this information to Tony Lévy.
65 Ed. H. A. Davidson, in Averroes, *Commentarium medium in Porphyrii Isagogen et Aristotelis Categorias* (Cambridge, 1969); English trans. in idem, *Averroes Middle Commentary on Porphyry's 'Isagoge'* (Cambridge, 1969).

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
115	1232	Averroes, *Middle Commentary on De interpretatione*	הבאור האמצעי למליצה	Arabic	Jacob Anatoli	Naples[66]
116	1232	Averroes, *Middle Commentary on the Syllogism*	הבאור האמצעי להיקש	Arabic	Jacob Anatoli	Naples
117	1232	Averroes, *Middle Commentary on Demonstration*	הבאור האמצעי למופת	Arabic	Jacob Anatoli	Naples
118	ca. 1240	Dunash ben Tamim, *Commentary on the Book of Creation* (4)	(פרוש על ספר יצירה)	Arabic	Naḥum ha-Maʿaravi	Spain or Morocco[67]
119	1244	Averroes, *Compendium of Aristotle's De anima*	כללי ספר הנפש	Arabic	Moses Ibn Tibbon	Provence
120	1244	Moses Maimonides, *On the Regimen of Health*	מאמר בהנהגת הבריאות	Arabic	Moses Ibn Tibbon	Provence[68]
121	between 1244 and 1283	Moses Maimonides, *On Poisons* (1)	המאמר הנכבד	Arabic	Moses Ibn Tibbon	Provence[69]
122	1245–7	Judah ha-Kohen, *The Learning of Science*	מדרש החכמה	Arabic	Judah ha-Kohen (the author himself)	Italy (Tuscany?)[70]
123	1246	Geminus, *Introduction to Phenomena*, Arabic trans.	חכמת הכוכבים הקצר	Arabic	Moses Ibn Tibbon	Italy (Naples)
124	1246?	Averroes, *Compendium of Aristotle's Physics*	כללי השמע הטבעי	Arabic	Moses Ibn Tibbon	Provence[71]
125	1248?	Averroes, *Compendium of Aristotle's De caelo et mundo*	כללי השמים והעולם	Arabic	Moses Ibn Tibbon	Provence
126	1248?	Al-Fārābī, *On the Political Regime*	ספר התחלות הנמצאות	Arabic	Moses Ibn Tibbon	Provence[72]
127	1250	Averroes, *Compendium of Aristotle's De generatione*	ספר ההויה וההפסד	Arabic	Moses Ibn Tibbon	Provence[73]
128	ca. 1250	Ibn al-Sid al-Batalyawsi, *Book of the Intellectual Spheres* (2)	ספר העגולות הרעיוניות	Arabic	Moses Ibn Tibbon	Provence[74]
129	ca. 1250–1300	Al-Fārābī, *The Enumeration of the Sciences* (1)	ראשית חכמה	Arabic	Shem Ṭov Ibn Falaquera	Provence[75]

130	Second half of 13th cent. (1250–70?)	Pseudo-Avicenna (Ḥunayn Ibn Isḥaq?), *De caelo et mundo*, Latin trans. by Dominicus Gundisalvus and Johannes Hispanus	ספר השמים והעולם	Latin	Solomon ben Moses Melguiri	Provence[76]
131	Second half of 13th cent. (1250–70?)	Matthaeus Platearius, *On Simple Medicines* (*Circa instans*) (1)	סירקא אצטניץ	Latin	Solomon ben Moses Melguiri	Provence
132	Second half of 13th cent. (1250–70?)	Pseudo-Aristotle, *On Sleep and Wakefulness*	השינה והיקיצה	Latin	Solomon ben Moses Melguiri	Provence[77]
133	ca. 1250?	Averroes, *Consultancy in Case of Diarrhea*	תשובה להשיב על תרעומת השלשול	Arabic	Jacob	Spain?
134	after 1250	Jordanus Rufus, *The Medicine for Horses (Hippiatria)*	(בטיפול הסוס ורפואתו)	Latin	Anonymous	Italy?
135	1252?	Averroes, *Compendium of Aristotle's Meteorologica*	ספר אותות עליונות	Arabic	Moses Ibn Tibbon	Provence
136	1253	Al-Fārābī, *The Short Prior Analytics*	קיצור קטן אחר באיכות ההיקש	Arabic	Moses Ibn Tibbon	Provence
137	after 1253	Brunus de Longoburgo, *Great Book of Surgery*	ספר כריתות	Latin	Hillel of Verona	Italy?
138	1254	Averroes, *Compendium of Aristotle's Parva Naturalia*	החוש והמוחש	Arabic	Moses Ibn Tibbon	Provence (Montpellier)[78]
139	1254	Moses Maimonides, *Treatise on the Art of Logic* (1)	מלות ההגיון	Arabic	Moses Ibn Tibbon	Provence[79]

66 See Zonta, *La filosofia antica*, pp. 182–3.
67 Ed. in progress by P. B. Fenton.
68 Ed. S. Muentner, *Rabbenu Mošeh ben Maimon, Hanhagat ha-beri'ut* (Jerusalem, 1957).
69 Ed. S. Muentner, *Rabbenu Mošeh ben Maimon, Sammei ha-mawet we-ha-refu'ot ke-negdam* (Jerusalem, 1942).
70 Ed. in progress by R. Fontaine.
71 Ed. J. Marcaria, *Qiṣṣurei Even Roshd ʿal šemaʿ ṭiveʿi le-Aristoteles* . . . (Riva di Trento, 1559).
72 Ed. in H. Filipowski, *Sefer he-'asif* (Leipzig, 1849), pp. 1–64.
73 Ed. S. Kurland, *Averrois Cordubensis, Commentarium medium et Epitome in Aristotelis De generatione et corruptione libros* (Cambridge, MA, 1958).
74 Ed. in D. Kaufmann, *Die Spuren al-Batlajusi's in der jüdischen Religionsphilosophie* (Budapest, 1880), Hebrew section.
75 Ed. M. David, *Schemtob ben Josef ibn Falaqueras Propädeutik der Wissenschaften Reschith Chokmah* (Berlin, 1902).
76 About this Hebrew redaction based upon the Latin version, see R. Glasner, "The Hebrew Version of *De caelo et mundo* Attributed to Ibn Sina," *Arabic Sciences and Philosophy* 6 (1996): 89–112.
77 See H. Kahana-Smilansky, "The Mental Faculties and the Psychology of Sleep and Dreams," in this volume.
78 Ed. H. Blumberg, *Averrois Cordubensis, Compendia librorum Aristotelis qui Parva naturalia vocantur* (Cambridge, MA, 1954).
79 Ed. I. Efros, "Maimonides' *Treatise on Logic*: The Original Arabic and Three Hebrew Translations," *Proceedings of the American Academy for Jewish Research* 8 (1938), Hebrew section, pp. 21–64.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
140	ca. 1254–60	Abu l-Qasim al-Zahrawi, *Book of Praxis* (1)	ספר השימוש	Arabic	Shem Ṭov ben Isaac of Tortosa	Spain?
141	1255	Themistius, *Paraphrase of Aristotle's Metaphysics*, book XII, Arabic trans. by Isḥaq Ibn Ḥunayn and Thabit Ibn Qurra	פירוש מאמר הנרשם באות 'למד'	Arabic	Moses Ibn Tibbon	Provence[80]
142	1257	Abu Bakr al-Razi, *Prescriptions (Antidotarium)* (1)	אקראבדין	Arabic	Moses Ibn Tibbon	Provence
143	1257 (or 1267?)	Moses Maimonides, *Commentary on Hippocrates' Aphorisms* (1)	(פירוש לפרקי אבוקרט)	Arabic	Moses Ibn Tibbon	Provence[81]
144	1258	Averroes, *Compendium of Aristotle's Metaphysics*	(קיצור מה שאחר הטבע)	Arabic	Moses Ibn Tibbon	Provence
145	1259	Averroes, *Middle Commentary on Aristotle's De caelo*	(ביאור בן רשד לספר השמים והעולם)	Arabic	Solomon Ibn Ayyub	Provence (Béziers)
146	1259	Nur al-Din al-Bitruji, *On the Principles of Astronomy*	מאמר בתכונה	Arabic	Moses Ibn Tibbon	Provence[82]
147	1259	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *Provisions for the Traveler* (2)	צידת הדרכים	Arabic	Moses Ibn Tibbon	Provence
148	1260	Avicenna, *Poem on Medicine (Cantica)* (1), with Averroes' commentary	ביאור ארגוזה	Arabic	Moses Ibn Tibbon	Provence
149	ca. 1260?	Averroes, *Middle Commentary on Aristotle's De anima* (1)	(ביאור בן רשד לספר הנפש)	Arabic	Shem Ṭov ben Isaac of Tortosa	Spain?
150	ca. 1260?	Abu Bakr al-Razi, *Prescriptions (Antidotarium)* (2)	אקראבדין	Arabic	Shem Ṭov ben Isaac of Tortosa	Spain?
151	ca. 1260?	Pseudo-Aristotle, *Book of the Pure Good (Liber de causis)*, Latin trans. by Gerardus Cremonensis (1)	מאמר הל"ב הקדמות	Latin	Hillel of Verona	Italy[83]
152	ca. 1260?	Galen, *Commentary on Hippocrates' Aphorisms*, Latin trans. by Constantinus Africanus	(אנפוריזמי)	Latin	Hillel of Verona?	Italy?

153	1261	Avicenna, *Poem on Medicine* (*Cantica*) (2)	ספר החרוזים	Arabic	Solomon Ibn Ayyub	Provence (Béziers)
154	1261	Averroes, *Middle Commentary on Aristotle's De anima* (2)	ביאור ספר הנפש	Arabic	Moses Ibn Tibbon	Provence[84]
155	1264	Pseudo-Aristotle, *Problemata physica*, Arabic trans. by Ḥunayn Ibn Isḥaq, books 1–4	שאלות טבעיות	Arabic	Moses Ibn Tibbon	Provence[85]
156	1264	Abu Bakr al-Razi, *The Aided Doctor (Al-Mansuri)* (2)	ספר אלמנצורי	Arabic	Shem Ṭov ben Isaac of Tortosa	Spain?
157	ca. 1265	Al-Fārābī, *Chapters on the Art of Logic*	הגיון	Arabic	Solomon Ibn Ayyub	Provence[86]
158	ca. 1270	Abu l-Faraj Ibn al-Ṭayyib, *Commentary on Aristotle's Historia Animalium* (parts)	ליקוטים (מספר בעלי חיים לארסטו)	Arabic	Shem Ṭov Ibn Falaquera	Spain[87]
159	ca. 1270?	Solomon Ibn Gabirol, *Source of Life* (sections)	ליקוטים מספר מקור חיים	Arabic	Shem Ṭov Ibn Falaquera	Spain[88]
160	ca. 1270?	Pseudo-Empedocles, *Book of the Five Substances* (sections)	ליקוטים מספר בנדקליס בעצמים) (החמישה	Arabic	Shem Ṭov Ibn Falaquera	Spain[89]

80 Ed. S. Landauer, *Themistii in Aristotelis Metaphysicorum librum Λ paraphrasis hebraice et latine* (Berlin, 1903); French trans. by R. Brague, *Themistius, Paraphrase de la métaphysique d'Aristote, livre Lamda* (Paris, 1999).

81 Ed. S. Muentner, *Rabbenu Mošeh ben Maimon, Peruš le-firqei Abuqrat* (Jerusalem, 1961).

82 Ed. B. R. Goldstein, *Al-Bitruji, On the Principles of Astronomy*, 2 vols. (New Haven, 1971).

83 Ed. S. Halberstam, *Hillel ben Šemu'el mi-Verona, Sefer Tagmulei ha-nefeš* (Lyck, 1874), ff. 41r–42v. See also J.-P. Rothschild, "Les traductions du *Livre des causes* et leurs copies," *Revue d'histoire des textes* 24 (1994): 393–484.

84 Ed. A. L. Ivry, *The Commentary of Averroes on Aristotle's De Anima in the Hebrew Translation of Moses ben Samuel Ibn Tibbon* (Jerusalem, 2003).

85 Ed. L. S. Filius, *The* Problemata Physica *Attributed to Aristotle: The Arabic Version of Hunain ibn Ishaq and the Hebrew version of Moses Ibn Tibbon* (Leiden, 1999), pp. 663–793.

86 See H. Blumberg, "Alfarabi's Five Chapters on Logic," *Proceedings of the American Academy of Jewish Research* 6 (1934–5): 115–22.

87 Only parts of this commentary were translated and inserted into Falaquera's *Opinions of the Philosophers*; they also circulated as an independent text, probably as abstracts from Falaquera's work. See M. Zonta, "Ibn al-Tayyib Zoologist and Hunayn Ibn Ishaq's Revision of Aristotle's *De animalibus*: New Evidence from the Hebrew Tradition," *Aram* 3 (1991): 235–47; idem, "The Zoological Writings in the Hebrew Tradition: The Hebrew Approach to Aristotle's Zoological Writings and to Their Ancient and Medieval Commentators in the Middle Ages," pp. 44–68 in C. Steel, G. Guldentops, and P. Beullens, eds., *Aristotle's Animals in the Middle Ages and Renaissance* (Leuven, 1999).

88 Ed. in S. Munk, *Mélanges de philosophie juive et arabe* (Paris, 1857), Hebrew section; new critical ed. R. Gatti, *Shelomoh Ibn Gabirol, Fons Vitae, Meqor Hayyim* (Genoa, 2001).

89 Ed. in D. Kaufmann, *Studien über Salomon Ibn Gabirol* (Budapest, 1899; repr. Jerusalem, 1971), pp. 17–51; French trans. by G. Hegedüs, pp. 208–31 in D. De Smet, *Empedocles Arabus. Une lecture neoplatonicienne tardive* (Brussels, 1998).

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
161	1270	Euclid, *Elements*, Arabic trans. by al-Ḥajjaj Ibn Yusuf and Isḥaq Ibn Ḥunayn, revised by Thabit Ibn Qurra (2)	שורשים / יסודות לאקלידיס	Arabic	Moses Ibn Tibbon	Provence (Montpellier)[90]
162	1270	Al-Ḥasan Ibn al-Haytham, *Commentary on the Premises of Euclid's Elements*	פירוש פתיחת המאמר	Arabic	Moses Ibn Tibbon	Provence (Montpellier)
163	ca. 1270	Al-Fārābī, *Commentary on Euclid's Elements*, introduction to books I and V	פירוש לפתיחת (המאמר)	Arabic	Moses Ibn Tibbon	Provence[91]
164	1271	Theodosius, *Spherics*, Arabic trans. by Qusta Ibn Luqa (1)	ספר תאודוסיוס בכדור	Arabic	Moses Ibn Tibbon	Provence
165	1271	Muḥammad al-Hassar, *Arithmetic*	חשבון	Arabic	Moses Ibn Tibbon	Provence[92]
166	1271	Menelaus, *Spherics*, Arabic trans. by Isḥaq Ibn Ḥunayn	ספר מילאוס בתמונות הכדוריות	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[93]
167	1271–5	Al-Ḥasan Ibn al-Haytham, *On the Configuration of the World* (1)	ספר התכונה	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[94]
168	1271–5?	Abu l-Qasim Ibn al-Saffar, *Astrolabe*	פירוש האצטרלב	Arabic	Jacob ben Makhir Ibn Tibbon	Provence
169	1271–5?	Ibrahim al-Zarkali, *The Calendar (Al-Safiha)*	אגרת המעשה בלוח הנקרא 'צפיחה'	Arabic	Jacob ben Makhir Ibn Tibbon?	Provence[95]
170	1272	Avicenna, *The Short Canon* (1)	הסדר הקטן	Arabic	Moses Ibn Tibbon	Provence (Montpellier)
171	1272	Euclid, *Postulates* (*Data*), Arabic trans. by Isḥaq Ibn Ḥunayn and Thabit Ibn Qurra	ספר המתנות	Arabic	Jacob ben Makhir Ibn Tibbon	Provence
172	ca. 1272?	Euclid, *Optics*, Arabic trans. by Isḥaq Ibn Ḥunayn and Thabit Ibn Qurra	חלוף המבטים	Arabic	Anonymous (Jacob ben Makhir Ibn Tibbon?)	Provence?
173	1273	Autolycus, *On the Rotating Sphere*, Arabic trans.	מאמר טולוקס בכדור המתנועע	Arabic	Jacob ben Makhir Ibn Tibbon	Provence

174	1274	Jābir Ibn Aflaḥ, *Correction of Ptolemy's Almagest* (1)	קיצור אלמגסטי	Arabic	Moses Ibn Tibbon	Provence
175	after 1274	Jābir Ibn Aflaḥ, *Correction of Ptolemy's Almagest* (2)	קיצור אלמגסטי	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[96]
176	1277	Moses Maimonides, *Medical Aphorisms* (1)	פרקי משה	Arabic	Zeraḥiah Ḥen	Italy (Rome)[97]
177	ca. 1277–90	Galen, *Composite Medicines According to Genera (Katagenos)*, books I–III, Arabic trans. (by Ḥunayn Ibn Isḥaq?)	קטאגניס	Arabic	Zeraḥiah Ḥen	Italy (Rome)[98]
178	ca. 1277–90	Pseudo-Galen, *Book on Illnesses and their Symptoms*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר החלאים והמקרים	Arabic	Zeraḥiah Ḥen	Italy (Rome)[99]
179	ca. 1277–90	Moses Maimonides, *On Poisons* (2)	(מאמר הנכבד)	Arabic	Zeraḥiah Ḥen	Italy (Rome)
180	ca. 1277–90	Moses Maimonides, *On Sexual Intercourse* (2)	מאמר המשגל	Arabic	Zeraḥiah Ḥen	Italy (Rome)[100]
181	ca. 1277–90	Moses Maimonides, *Commentary on Hippocrates' Aphorisms* (2)	(פירוש לפרקי אבוקרט)	Arabic	Zeraḥiah Ḥen	Italy (Rome)[101]

[90] See Lévy, "The Establishment," p. 433; idem, "Les *Eléments* d'Euclide en hébreu (XIII^{e}–XVI^{e} siècles)," pp. 79–94 in M. Aouad, A. Elamrani-Jamal, and A. Hasnaoui, eds., *Perspectives arabes et médiévales sur la tradition scientifique et philosophique grecque* (Paris, 1997).

[91] Ed. G. Freudenthal, "La philosophie de la géométrie d'Al-Fârâbî: Son commentaire sur le début du I^{er} livre et le début du V^{e} livre des *Éléments* d'Euclide," *Jerusalem Studies in Arabic and Islam* 11 (1988): 104–219.

[92] See T. Lévy, "L'algèbre arabe dans les textes hébraïques (I). Un ouvrage inédit d'Isaac ben Salomon al-Ahdab (XIV^{e} siècle)," *Arabic Sciences and Philosophy* 13 (2003): 269–301, on pp. 281–6.

[93] See Lévy, "The Establishment," p. 434.

[94] See Y. T. Langermann, *Ibn al-Haytham's "On the Configuration of the World"* (New York, 1990).

[95] See Lévy, "The Establishment," p. 442 n. 30.

[96] This translation appears to have been lost and is extant only in the revision by Samuel of Marseilles (see below).

[97] This was employed for the critical edition of the Arabic text: G. Bos, *Maimonides Medical Aphorisms: Treatises 1–5: A Parallel Arabic-English Edition* (Provo, 2004); idem, *Maimonides Medical Aphorisms: Treatises 6–9: A Parallel Arabic-English Edition* (Provo, 2007). Only chapter 25 of the Hebrew version was published in a noncritical edition by S. Muenter, *Rabbenu Mošeh ben Maimon, Pirqei Mošeh (bi-refu'ah), be-targumo šel R. Natan ha-Me'ati* (Jerusalem, 1941), pp. 323–98. On the textual history of this work by Maimonides, see G. Bos, "Maimonides' Medical Aphorisms: Towards a Critical Edition and Revised English Translation," *Korot* 12 (1996–7): 35–79.

[98] The original Hebrew text of Zeraḥiah's introduction was published in M. Steinschneider, *Catalog der hebraeischen Handschriften in der Stadtbibliothek zu Hamburg* (Hamburg, 1878), pp. 197–9.

[99] Ed. in progress by G. Bos.

[100] Ed. Kroner, *Ein Beitrag zur Geschichte der Medizin.*

[101] See G. Tamani, "Codici ebraici Pico Grimani nella Biblioteca Arcivescovile di Udine," *Annali di Ca' Foscari* 10, s.or. 2 (1971): 1–25, on p. 18.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
182	ca. 1277–90	Hippocrates, *On Superfetation*, Arabic trans.	ספר אבוקרט בהריון	Arabic	Zeraḥiah Ḥen	Italy (Rome)[102]
183	ca. 1277–90	Moses Maimonides, *On Hemorrhoids* (2)	מאמר בטחורים	Arabic	Zeraḥiah Ḥen	Italy (Rome)[103]
184	ca. 1277–90	Pseudo-Galen, *On the Regimen of Health*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר ההנהגה לגלינוס	Arabic	Zeraḥiah Ḥen	Italy (Rome)[104]
185	1279	Avicenna, *Canon* (1)	ספר הקנון, ביאורו ספר הכולל	Arabic	Natan ha-Meʾati	Italy (Rome)[105]
186	1280	Anonymous, *On the Origin of the Eclipses and the Aspect of the Planets*	מאמר על סבת לקות המאורות ועל מבטי כוכבי לכת ומשפטיהם	Arabic	Natan ha-Meʾati	Italy (Rome?)
187	ca. 1280	Avicenna, *Canon* (2), books I-II	אלקנון	Arabic	Zeraḥiah Ḥen	Italy (Rome)[106]
188	ca. 1280	Jābir Ibn Aflaḥ, *Correction of Ptolemy's Almagest* (3)	קיצור אלמגסטי	Arabic	Natan ha-Meʾati	Italy (Rome?)[107]
189	ca. 1280	Galen, *Commentary on Hippocrates' Prognostics*, Arabic trans. by Ḥunayn Ibn Isḥaq	הקדמת הידיעה	Arabic	Natan ha-Meʾati	Italy (Rome)
190	ca. 1280	Hippocrates, *On Airs, Times, Waters and Places*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר באוירים ובזמנים והמימות והארצות	Arabic	Natan ha-Meʾati	Italy (Rome)
191	ca. 1280	Abu l-Qasim ʿAmmar al-Mawsili, *On the Cure of the Eye*	(המשובח)	Arabic	Natan ha-Meʾati	Italy (Rome)
192	ca. 1280	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *Epistle about Forgetfulness* (1)	אגרת שלוחה	Arabic	Natan ha-Meʾati	Italy (Rome)[108]
193	ca. 1280	Moses Maimonides, *Medical Aphorisms* (2)	פרקי משה	Arabic	Natan ha-Meʾati	Italy (Rome)[109]
194	ca. 1280	Pseudo-Ptolemy (Abu Jaʿfar Aḥmad Ibn Yusuf), *Hundred Aphorisms (Centiloquium)*, Latin trans. by Plato Tiburtinus (1)	מאה שערים	Latin	Jacob ben Elijah	Italy (Venice)[110]
195	ca. 1280	Abu Maʿshar, *Great Introduction*, Latin trans. by Johannes Hispanus	מבוא הגדול מחכמת התכונה	Latin	Jacob ben Elijah	Italy (Venice)[110]

196	ca. 1280?	Abu Marwan Ibn Zuhr, *Book of Foods and Medicines*	ספר המזונות	Arabic	Anonymous, son of Eliezer (Natan ha-Me'ati?)	Italy?
197	ca. 1280–1300	Moses Maimonides, *Treatise on the Art of Logic* (2)	מלות ההגיון	Arabic	Aḥiṭuv of Palermo	Italy (Palermo?)[111]
198	ca. 1280–1300?	Nicholas Praepositus, *Prescriptions (Antidotarium)* (2)	אנטידוטאריום	Latin	Jacob ha-Qatan	Provence (Montpellier?)[112]
199	ca. 1280–1300?	Ruggerus (Panormitanus?), *Book on Oil and Water*	ספר השמן והמים	Latin	Jacob ha-Qatan?	Provence?
200	1282	Hippocrates, *On Acute Illnesses*, Arabic trans. by Ḥunayn Ibn Isḥaq	הנהגת החוליים החודיים	Arabic	Natan ha-Me'ati	Italy (Rome)
201	1283 or earlier	Ḥunayn Ibn Isḥaq, *Introduction to Galen's Art of Medicine*	ספר המבוא למלאכת הרפואה	Arabic	Moses Ibn Tibbon? (in two redactions)	Provence?[113]
202	1283	Abu Bakr al-Razi, *The Book of Division and Lessening*	ספר החילוק והחילוף	Arabic	Moses Ibn Tibbon	Provence

102 Ed. M. Zonta, "A Hebrew Translation of Hippocrates' *De Superfoetatione*: Historical Introduction and Critical Edition," *Aleph* 3 (2003): 97–143.

103 Discovered by G. Bos, who is using it for a critical edition of the work (personal communication).

104 Ed. G. Bos in G. Bos and I. Garofalo, "A Pseudo-Galenic *Treatise on Regimen*: The Hebrew and Latin Translations from Hunayn Ibn Ishaq's Arabic Version," *Aleph* 7 (2007): 43–95, on pp. 78–85.

105 See the list of extant manuscripts in B. Richler, "Manuscripts of Avicenna's *Kanon* in Hebrew Translation: A Revised and Up-to-Date List," *Korot* 8 [3–4] (1982): 145*–168*. Richler first pointed out the existence of four other anonymous Hebrew translations of books II, III, and IV of the work (in addition to those by Zeraḥiah Ḥen and Joseph ha-Lorqi, whom he misnames "Joshua Lorqi"); their origin and date are still unknown. See also L. Ferre, "Avicena Hebraico: la traducción del *Canon de Medicina*," *Miscelánea de estudios árabes y hebraicos, sección hebrea* 52 (2003): 163–82; see also eadem, "Tras las huellas del *Canon* hebraico," *Canon medicinae Avicena* (Barcelona, 2002), pp. 243–87.

106 See the list of extant manuscripts in Richler, "Manuscripts of Avicenna's *Kanon*"; see also Ferre, "Avicena Hebraico"; eadem, "Tras las huellas." According to H. Rabin, this translation was based on that by Natan ha-Me'ati ("History of the Hebrew Translation of the *Canon*" [in Hebrew], *Melilah* 3–4 [1950]: 132–42, on p. 134).

107 This translation appears to have been lost and is extant only in the revision by Samuel of Marseilles (see below).

108 Ed. G. Bos, *Ibn al-Jazzar On Forgetfulness and Its Treatment* (London, 1995), pp. 46–52.

109 Ed. S. Muentner, *Rabbenu Mošeh ben Maimon, Pirqei Mošeh* (Jerusalem, 1959); but see also Bos, *Maimonides' Medical Aphorisms*.

110 See J. Shatzmiller, "Jacob Ben Elie, traducteur multilingue à Venise à la fin du XIIIe siècle," *Micrologus* 9 (2001): 195–202.

111 Ed. Efros, "Maimonides' *Treatise on Logic*," pp. 65–100. I owe the information about the probable date to Dr. Giuseppe Mandalà (University of Palermo), who is studying Aḥiṭuv's work as a philosopher and as a translator.

112 Steinschneider (*Hebraeischen Übersetzungen*, pp. 814–16) lists a number of manuscripts of this work, which might include other anonymous translations thereof.

113 See Ferre, "The Medical Work of Hunayn ben Ishaq."

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
203	1283	Galen, *Commentary on Hippocrates' Aphorisms*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר הפרקים לאבקראט בפירוש גאלינוס	Arabic	Natan ha-Me'ati	Italy (Rome)
204	1284	Averroes, *Middle Commentary on Aristotle's Physics* (1)	ספר השמע הטבעי לארסטו, ביאור בן רשד	Arabic	Zeraḥiah Ḥen	Italy (Rome)[114]
205	1284	Aristotle, *De generatione et corruptione*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר ההויה וההפסד לארסטו	Arabic	Zeraḥiah Ḥen	Italy (Rome)[115]
206	1284	Themistius, *Paraphrase of Aristotle's De caelo*, Arabic trans. by Yaḥya Ibn ʿAdi	ספר השמים והעולם לארסטו עם פרוש תאמסטיאוס	Arabic	Zeraḥiah Ḥen	Italy (Rome)[116]
207	1284	Aristotle, *De anima*, Arabic trans. by Isḥaq Ibn Ḥunayn and ʿIsa Ibn Zurʿa	ספר הנפש לארסטו	Arabic	Zeraḥiah Ḥen	Italy (Rome)[117]
208	1284	Averroes, *Middle Commentary on Aristotle's Metaphysics* (1)	ביאור בן רשד ממה שאחר הטבע לארסטו	Arabic	Zeraḥiah Ḥen	Italy (Rome)[118]
209	1284	Pseudo-Aristotle, *Book of the Pure Good (Liber de causis)* (2)	הביאור בטוב הגמור	Arabic	Zeraḥiah Ḥen	Italy (Rome)[119]
210	1284	Pseudo-Fārābī, *Treatise on the Quiddity of the Soul*	מאמר במהות הנפש	Arabic	Zeraḥiah Ḥen	Italy (Rome)[120]
211	1287?	Abu l-Qasim al-Zahrawi, *Book of Praxis* (2)	החפץ השלם	Arabic	Meshullam ben Jonah	Provence?
212	1288–9	Averroes, *Epitome of the Organon*	קיצור מכל מלאכת הגיון	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[121]
213	1289	Euclid, *Elements*, Arabic trans. by al-Ḥajjaj Ibn Yusuf and Isḥaq Ibn Ḥunayn, revised by Thabit Ibn Qurra (3)	שורשים / יסודות לאקלידיס	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[122]

214	1290	Theodosius, *Spherics*, Arabic trans. by Qusta Ibn Luqa (2)	ספר תאודוסיוס בכדור	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[123]
215	1292?	Abu Ḥamid al-Ghazali, *Intentions of the Philosophers*, parts 1 and 2 (1)	דעות הפילוסופים	Arabic	Isaac Albalag	Spain or Provence[124]
216	after 1292?	Abu Ḥamid al-Ghazali, *Intentions of the Philosophers*, part 3 (1)	דעות הפילוסופים	Arabic	Isaac Pulgar	Spain
217	1295	Abu l-Qasim al-Zahrawi, *Book of Praxis* (3), book 1	צירוף (?)	Arabic	Joseph Ibn Waqqar	Spain?
218	after 1295	Bernardus de Gordon, *On the Preservation of Human Life*	שמירת חיים	Latin	Anonymous	Spain?[125]
219	1296?	Bernardus de Gordon, *On Prognosis* (1)	ימים גבוליים והקדמת הידיעה	Latin	Anonymous for "Giles"	Provence?[125]
220	1297	Yuhanna Ibn Masawayh (senior or junior?), *Surgery*, Latin trans. by Faraj Ibn Salim (Farragius)	מאמר העין ממלאכת היד נקרא 'מושיע'	Latin	Jacob ben Joseph ha-Levi	Italy?
221	1297	Arnaldus de Villanova (?), *Book on Paralysis* (part of the *Arnaldina*?)	מאמר הפראלישין	Latin	Jacob ben Joseph ha-Levi	Italy?

[114] Books 1 and 2 were employed by S. Harvey in his Ph.D. dissertation, "Averroes on the Principles of Nature: The Middle Commentary on Aristotle's *Physics* I–II," Harvard University, 1977.

[115] Ed. A. Tessier, "La traduzione arabo-ebraica del *De generatione et corruptione* di Aristotele," *Atti dell'Accademia Nazionale dei Lincei. Memorie della Classe di Scienze Morali* s. VIII, v. 28 (1984): 5–122. On a newly discovered Hebrew manuscript, see also M. Zonta, "Aristotle's *De Anima* and *De Generatione et corruptione* in Medieval Hebrew Tradition: New Details Regarding Textual History Coming from a Neglected Manuscript," pp. 91–101 in R. Fontaine et al, eds., *Studies in the History of Culture and Science* (Leiden, 2011).

[116] Ed. S. Landauer (Berlin, 1902); see also M. Zonta, "*Hebraica Veritas.* Temistio, Parafrasi del *De coelo* di Aristotele. Tradizione e critica del testo," *Athenaeum* 82 (1994): 403–28.

[117] Ed. G. Bos, *Aristotle's* De Anima *Translated into Hebrew by Zerahyah ben Isaac ben Shealtiel Hen* (Leiden, 1994). On a newly discovered Hebrew manuscript, see above, n. 115.

[118] Ed. M. Zonta in his Ph.D. dissertation, "La tradizione ebraica del Commento Medio di Averroè alla Metafisica di Aristotele," University of Turin, 1995; published Pavia 2011.

[119] Ed. I. Schreiber, *Pseudo-Aristoteles Liber de causis* (Budapest, 1916). See also Rothschild, "Les traductions du *Livre des causes.*"

[120] Ed. in H. Edelmann, *Ḥemdah genuzah* (Koenigsberg, 1856), ff. 45–9; repr. with errata and a French trans. by G. Freudenthal, "La Quiddité de l'âme, traité populaire néoplatonisant faussement attribué à Al-Fârâbî: Traduction annotée et commentée," *Arabic Sciences and Philosophy* 13 (2003): 173–237.

[121] Ed. J. Marcaria, *Kol meleḵet higgayon le-Aristotelo* (Riva di Trento, 1560).

[122] See Lévy, "The Establishment," p. 433; idem, "Les *Eléments* d'Euclide en hébreu."

[123] See Lévy, "The Establishment," p. 434 n. 4.

[124] Ed. of Albalag's glosses by G. Vajda, *Isaac Albalag, Tiqqun ha-deʿot* (Jerusalem, 1973).

[125] See L. Ferre, "Las traducciones hebreas de la obra médica de Bernard de Gordon," *Miscelánea de estudios árabes y hebraicos, sección hebrea* 49 (2000): 191–205.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
222	1297–1301?	Magister Gualtierus, *On Poisons*	מאמר בארסים	Latin	Jacob ben Joseph ha-Levi	Italy?
223	1299	Galen, *Commentary on Hippocrates' On Airs, Waters and Places*, Arabic trans.	ספר המימות והאוירים לאפוקרט החשוב ממה שבארו גאלינוס	Arabic	Solomon ben Natan ha-Me'ati	Italy (Rome?)[126]
224	1299	Bernardus de Gordon, *The Regimen of Acute Illnesses*	חיבור בהנהגת החדות	Latin	Anonymous for "Giles"	Provence?[125]
225	1299	Bernardus de Gordon, *The Method for Unnatural Treatment*	לוח התחבולה	Latin	Anonymous for "Giles"	Provence?[125]
226	end of 13th cent.	Anonymous, *The Secret of Secrets (Secretum Secretorum)*, "short version"	סוד הסודות	Arabic	Anonymous (not Judah al-Ḥarizi!)	?[127]
227	end of 13th cent.	Yuhanna Ibn Masawayh (junior?), *General Canons* and *Simple Medicines* (1), Latin trans.?	מהעצה והטבעים והתנאים של רפואות המשלשלות הפשוטות והמורכבות	Latin or Arabic?	Samuel ben Jacob	Italy (Capua)
228	end of 13th cent.?	Yuhanna Ibn Sarabiyyun, *Practical Medicine*, Latin trans. by Gerardus Cremonensis	ספר סרפיאוני / ספר התקבצות האחרון	Latin	Moses ben Mazliaḥ	Italy (Capua)
229	end of 13th cent.?	Moses ha-Levi, *Metaphysical Treatise*	מאמר אלוהי	Arabic	Anonymous	Spain[128]
230	end of 13th cent.?	Qusta Ibn Luqa, *On the Difference between Spirit and Soul*, Latin translations by Johannes de Sevilla and Hermannus de Carintia	מהפרק שהוא בין הרוח ובין הנפש	Latin	Anonymous	Spain?[129]
231	end of 13th cent.?	Pseudo-Guillaume de Conches, *Summary of Philosophy (Summa philosophiae)* (part)	ספר חכמה כללית לארסטו	Latin	Anonymous	Italy[130]
232	end of 13th cent.?	Guillaume de Conches, *Philosophy (Philosophia)*		Latin	Anonymous (same as previous)	Italy[131]

233	end of 13th cent.?	Abu Marwan Ibn Zuhr, *On the Difference between Honey and Sugar*	מאמר בהבדל בין הדבש והסוכר	Arabic	Bonsenior ben Ḥasdai	Provence?
234	before 1300	Aristotle, *Book on Animals* (= *Historia, De partibus*, and *De generatione animalium*), Arabic trans. by Pseudo-Yahya Ibn al-Biṭriq, from the Latin trans. by Michael Scotus	ספר בעלי חיים	Latin	Anonymous (Samuel ha-Levi?)	Northern France[132]
235	before 1300	Pseudo-Aristotle (Luqa bar Sarabiyyun), *Book on Minerals*	ספר האבנים	Arabic	Anonymous	Provence?[133]
236	before 1300	Isaac Israeli, *Book on Universal Diets*	ספר מחובר ממאמרי הראשונים בטבע המזונות וכוחותם ותועלותיהם	Arabic	Anonymous	?
237	1300–50	Anonymous, *Abbreviatio of Peter of Spain's Tractatus*	ספר ההגיון לאריסטו	Latin	Anonymous	Provence[134]
238	14th cent.?	Moses Maimonides, *Treatise on the Art of Logic* (3)	מלות ההגיון	Arabic	Joseph ben Joshua Vives of Lorca	Spain[135]

[126] Ed. A. Wasserstein, "Galen's Commentary on the Hippocratic Treatise *Airs, Waters, Places*," *Proceedings of the Israel Academy of Sciences and Humanities*, English Section, Vol. 11/3 (1982).

[127] Ed. and trans. into English by M. Gaster, "The Hebrew Version of the *Secretum Secretorum*," *Journal of the Royal Asiatic Society* (1907): 871–912; (1908): 111–62, 1065–84. See also A. I. Spitzer, "The Hebrew Translations of the *Sod ha-sodot* and its Place in the Transmission of the *Sirr al-asrâr*," pp. 34–54 in W. F. Ryan and C. B. Schmitt, eds., *Pseudo-Aristotle, The Secret of Secrets: Sources and Influences* (London, 1982).

[128] See H. A. Wolfson, "Averroes' Lost Treatise on the Prime Mover," *Hebrew Union College Annual* 23 (1950–1): 683–710.

[129] Ed. S. Friedländer, in J. Wilcox, "The Transmission and Influence of Qusta Ibn Luqa's *On the Difference between Spirit and Soul*," Ph.D. dissertation, City University of New York, 1985.

[130] See G. Vajda, "Une version hébraïque de la *Summa Philosophiae* de Guillaume de Conches (?)," *Revue des études juives* 115 (1956): 117–24; Y. T. Langermann, "A Hebrew Text of Guillaume of Conches' *Encyclopaedia*" (in Hebrew), *Qiryat Sefer* 60 (1985): 328–9.

[131] I would like to thank Jean-Pierre Rothschild for alerting me to the existence of this translation.

[132] See G. Furlani, "Le antiche versioni araba, latina ed ebraica del *De partibus animalium* di Aristotele," *Rivista degli Studi Orientali* 9 (1922): 237–57; Zonta, *La filosofia antica*, pp. 195–6; idem, "The Zoological Writings in the Hebrew Tradition."

[133] See M. Zonta, "Mineralogy, Botany and Zoology in Medieval Hebrew Encyclopaedias: 'Descriptive' and 'Theoretical' Approach to Arabic Sources," *Arabic Sciences and Philosophy* 6 (1996): 263–315, esp. pp. 311–14.

[134] See C. Manekin, "When the Jews Learned Logic from the Pope: Three Medieval Hebrew Translations of the *Tractatus* of Peter of Spain," *Science in Context* 10 (1997): 395–430, esp. p. 396.

[135] Ed. Efros, "Maimonides' *Treatise on Logic*," pp. 101–29.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
239	14th cent.?	Averroes, *On the Substance of Heaven (De substantia orbis)* (1)	מאמר בעצם הגלגל	Arabic	Anonymous	Provence?[136]
240	14th cent.?	Averroes, *Physical (and Metaphysical) Questions*	ספר הדרושים הטבעיים	Arabic	Anonymous	Provence?[137]
241	14th cent.?	Abu l-Qasim Ibn Idris, *On the First Matter* and *On the Meaning of Forms*; Abu Jaʿfar Ibn Sabiq, *On the First Matter*	מאמר בחמר הראשון; מאמר בענין הצורות; מאמר בחמר הראשון	Arabic	Anonymous (same as previous)	Provence?
242	14th cent.?	Averroes, *Decisive Treatise*	הבדל הנאמר במה שבין התורה והחכמה מן הדבקות	Arabic	Anonymous	?[138]
243	14th cent.?	Averroes, *Appendix* to the *Decisive Treatise* (1 and 2)		Arabic	Two anonymous translators	?[139]
244	14th cent.?	Averroes, *Disclosure of the Proof Methods Concerning the Principles of Religion*	דרכי הראיות בסברות הדת	Arabic	Anonymous	?[140]
245	14th cent.?	Isaac Israeli, *Book of Definitions* (2)	חיבור יצחק הישראלי	Arabic	Nissim ben Solomon	Spain or Provence[141]
246	14th cent.?	Abu ʿAbdallah Muḥammad al-Tabrizi, *Commentary on the 25 Propositions of Maimonides' Guide of the Perplexed* (1)	פירוש כ"ה הקדמות שבמורה נבוכים	Arabic	Anonymous	Spain or Provence[142]
247	14th cent.?	Al-Fārābī, *Explanation of Aristotle's Purpose in his Metaphysics*	מאמר בכוונת ארסטו בספר מה שאחר הטבע	Arabic	Anonymous	Provence?
248	14th cent.?	Al-Fārābī, *Exhortation on the Way to Happiness*	ההערה על דרך ההצלחה	Arabic	Anonymous	Provence?
249	14th cent.?	Al-Fārābī, *Selected Aphorisms*	פרקים חלוקים	Arabic	Anonymous	Provence?

250	14th cent.?	Pseudo-Euclid, *Book of Mirrors* (an Arabic work)	ספר המראים	Arabic	Anonymous	Provence?[143]
251	14th cent.?	Jābir Ibn Aflaḥ, *Commentary on Menelaus' Spherics*	הדבור בתמונה החיתוכית למילאוש	Arabic	Anonymous (Qalonymos ben Qalonymos?)	Provence?
252	14th cent.?	Archimedes, *The Measurement of the Circle*, Arabic trans. by Thabit Ibn Qurra (1)	ספר ארכימידיס במשיחת העגולה	Arabic	Anonymous (not Qalonymos ben Qalonymos!)	Provence?[144]
253	14th cent.?	Archimedes, *The Measurement of the Circle*, anonymous Arabic trans. (2)	(במשיחת העגולה)	Arabic	Anonymous	?[144]
254	14th cent.?	Sahl Ibn Bishr, *Introduction to Astrology*	כללים להחכם שאול בן בצר הישראלי	Arabic	Anonymous	?
255	14th cent.?	ʿUmayya Ibn Abi l-Salt, *Encyclopedia*, section on music (corresponding to part of Al-Fārābī, *The Great Book on Music*)		Arabic	Anonymous	Spain?[145]
256	14th cent.?	Galen, *Book of Crisis*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר בחראן	Arabic	Boniac Solomon	Spain (Barcelona)

[136] Averroes, *De Substantia Orbis: Critical Edition of the Hebrew Text, With English Translation and Commentary*, ed. A. Hyman (Cambridge, MA, and Jerusalem, 1986).

[137] English trans. by H. Tunik Goldstein, *Averroes' Questions in Physics (From the Unpublished Sefer Ha-Derusim Ha-Tibʿiyim)* (Dordrecht, 1990). See also S. Rosenberg, "The Hebrew Translations of Averroes' *Physical Questions* and Moses Narboni's Commentaries," (in Hebrew), *Qiryat Sefer* 57 (1982): 715–24.

[138] Ed. N. Golb, "The Hebrew Translation of Averroes' *Fasl al-Maqal*," *Proceedings of the American Academy for Jewish Research* 25 (1956): 91–113; 26 (1957): 41–64.

[139] See G. Vajda, "Les deux versions hébraïques de la dissertation d'Averroès sur la science divine," *Revue des études juives* 113 (1954): 63–66.

[140] See S. Di Donato, "La trasmissione del *Kitab al-kašf ʿan manahig al-adilla fi ʿaqaʾ id al-milla*: gli indizi delle diverse tradizioni del trattato nella traduzione ebraica" (forthcoming).

[141] Ed. H. Hirschfeld, "A Work by Isaac ha-Rofé Israeli" (in Hebrew), pp. 131–41 (Heben section) in *Festschrift Moritz Steinschneider* (Leipzig, 1896).

[142] Ed. M.-R. Hayoun, "Moses Maimonides und Muhammad al-Tabrisi; Ausgabe der hebraeischen [anonymen] Uebersetzung des Kommentars al-Tabrisis zu den XXV Leitsaetzen des Maimonides im II. Teil des Moreh Nebuchim (Fuehrer der Verwirrten)," *Terumah* 5 (1996): 201–45.

[143] See Lévy, "The Establishment," p. 433 (and bibliography).

[144] Ibid.; see also T. Lévy, "*La Mesure du cercle* en hébreu. Deux versions distinctes du texte archimédien," pp. 103–137 in Fontaine et al, eds., *Studies in the History of Culture and Science.*

[145] Ed. and English trans. by H. Avenary, "The Hebrew Version of Abu l-Salt's *Treatise on Music*," *Yuval* 3 (1974): 7–82; ed. I. Adler, "Hebrew Writings Concerning Music in Manuscript and Printing Books from Geonic Times up to 1800," *Répertoire international des sources musicales*, B/IX, Vol. 2 (Munich, 1975), pp. 9–35.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
257	14th cent.?	Galen, *Treatise on Phlebotomy*, Latin trans.	ספר ההקזה של גידים	Latin	Anonymous	?
258	14th cent.?	Galen, *Regimen for the Epileptic Boy*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר בהנהגת הנער הנכפה	Arabic	Anonymous	?
259	14th cent.?	Pseudo-Galen or Rufus, *On Melancholy*, Arabic compendium by Istafan Ibn Basil (?)	כללי ספר גלינוס במרה השחורה	Arabic	Anonymous	?
260	14th cent.?	Anonymous, *Compendium of Galen's Work on Urine*, Arabic trans. by Ḥunayn Ibn Isḥaq	אסיפת מראות השתן	Arabic	Anonymous	?
261	14th cent.?	Pseudo-Hippocrates, *On the Aspects of Urine*	מראות השתן	Arabic or Latin?	Joseph ben Isaac (Israeli of Toledo?)	Spain?
262	14th cent.?	(Pseudo-)Paulus de Aegina, *On Poisons*	ספר לפולוס הרופא בעניני סם המות	Arabic	Anonymous	Italy?
263	14th cent.?	Plato "the Arab," *On Phlebotomy*		Arabic	Anonymous	?
264	14th cent.?	Avicenna, *The Short Canon* (2)	ספר נקרא קאנון קטון	Arabic	Anonymous	Spain?
265	14th cent.? (certainly before ca. 1480)	Avicenna, *On Cardiac Drugs* (1)	סמים לביים	Arabic	Anonymous	?
266	14th cent.?	Avicenna, *On Cardiac Drugs* (2), Latin trans. by Arnaldus de Villanova	הרפואות הלביות	Latin	Anonymous	?
267	14th cent.?	Ḥunayn Ibn Isḥaq, *Introduction to Galen's Art of Medicine*, Latin trans. by Marcus Toletanus (1 and 2)	מבוא / יואניציאו	Latin	Anonymous	?[146]
268	14th cent.?	Anonymous, *Commentary on Ḥunayn Ibn Isḥaq's Introduction to Galen's Art of Medicine*	פירוש יואניציאו	Latin	Anonymous	?[146]

269	14th cent.?	Yuhanna Ibn Masawayh (senior?), *Aphorisms*	הערות מן הרפואה	Arabic	Anonymous	?
270	14th cent.?	Yuhanna Ibn Masawayh (junior?), *General Canons* and *Simple Medicines* (2), Latin trans.?	(הרפואות הפשוטות); (?)	Arabic or Latin?	Anonymous	?
271	14th cent.?	Yuhanna Ibn Masawayh (junior?), *Prescriptions (Antidotarium)* (1, 2, 3, and 4), Latin trans.?	אקראבדין, והוא קיצור סודות; ספר מסואי ואנטוטריאו מהמרקחות והריקוחים; ריקוח אבן מאישוייא	Arabic or Latin?	Four anonymous translators	?
272	14th cent.?	Yuhanna Ibn Masawayh (junior?), *Practical Medicine* (1 and 2), Latin trans.	(סימני החלאים מספר המסואי) (?)	Latin	Two anonymous translators	?
273	14th cent.?	ʿAli al-Qurashi Ibn al-Nafis, *Compendium of Avicenna's Canon*	ספר המוגיז	Arabic	Anonymous	Greece?
274	14th cent.?	Abu Bakr al-Razi, *On the Illnesses of the Joints*, Latin trans. by Gerardus Cremonensis?	מחוליי החיבורים	Latin	Anonymous	?
275	14th cent.?	Abu Bakr al-Razi, *On the Illnesses of Children* (1 and 2)	מהנהגת הנערים הקטנים; מחולי הנערים כפי ראזי	Arabic	Two anonymous translators	?
276	14th cent.?	Abu Bakr al-Razi, *Razi's Medical Aphorisms*	פרקי ראזי	Arabic	Anonymous	?
277	14th cent.?	Abu Bakr al-Razi, *Aphorisms*	ספר הפסקות	Arabic	Anonymous	?
278	14th cent.?	Abu Bakr al-Razi (?), *On the Properties, Utilities, and Damages of the Limbs of Animals*, Latin trans.	מסגולות איברי בעלי חיים ותועליותיהם והיזקם	Latin	Anonymous	?
279	14th cent.?	Abu Bakr al-Razi, *Apology of the Careless Physician*	מאמר במה שיקרה במלאכת הרפואה מן המקרים	Arabic	Anonymous	?

[146] See Ferre, "The Medical Work of Hunayn ben Ishaq."

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280	14th cent.?	Abu Bakr al-Razi, *On Phlebotomy*	מאמר בהקזה	Arabic	Anonymous	?
281	14th cent.?	ʿUbayd Ibn ʿAli Ibn Jurji (or Juraja), *On Sexual Impotence*	מאמר במיעוט המשגל	Arabic	Anonymous	?
282	14th cent.?	Ali Ibn Ridwan, *Commentary on Galen's Elements*	פירוש מלאכה קטנה	Arabic	Anonymous	?
283	14th cent.?	Abu l-Ḥasan Sufyan, *Simple Medicines*	(רשימת סמים)	Arabic	Anonymous	?
284	14th cent.?	Abu l-Qasim al-Zahrawi, *Book of Praxis* (4)	שימוש הרפואות	Arabic	Anonymous	?
285	14th cent.?	Abu Marwan Ibn Zuhr, *The Relief*	החלק הכולל	Arabic	Anonymous	?
286	14th cent.?	Abu Marwan Ibn Zuhr, *On the Regimen of Health*	הנהגת הבריאות	Arabic	Anonymous	?
287	14th cent.?	Anonymous (Judah?), *Bed of Perfume*	ערוגת הבושם	Arabic	Solomon of Narbonne	Provence?
288	14th cent.?	Zayn al-Din al-Jurjani, *Medical Encyclopedia*	(חבור גדול ברפואה)	Persian	Anonymous	Greece or Turkey?
289	14th cent.?	Isaac Israeli, *Book on Urines* (2), Latin trans. by Constantinus Africanus	ספר השתנים / הוראת השתן	Latin	Anonymous	?
290	14th cent.? (after previous one?)	Isaac Israeli, *Book on Urines* (3)	ביאור הוריות השתן	Arabic or Latin?	Anonymous	?
291	14th cent.?	Moses Maimonides, *Commentary on Hippocrates' Aphorisms* (3)	(פירוש לפרקי אבוקרט)	Arabic	Anonymous	?
292	14th cent.?	Arnaldus de Villanova, *The Regimen of Health* (1)	הנהגת הבריאות	Latin	Anonymous	?
293	14th cent.?	Arnaldus de Villanova, *The Regimen of Health*, Catalan trans. by Berenguer Ça Riera	הנהגת הבריאות	Catalan	Joseph ben Judah ha-Sefaradi	?[147]
294	14th cent.?	Johannes de Parma, *Practical Medicine* (1, 2, and 3)	פראטיקא; המלאכה הקטנה (?); ארנובדינה	Latin	Three anonymous translators	?[148]
295	14th cent.?	Bernardus de Gordon, *On Prognosis* (2)	ספר הגבולים	Latin	Anonymous	?[149]

296	14th cent.?	Cordone de Papia, *Little (Medical) Praxis*	פרטיקולא	Latin	Anonymous	Italy?
297	14th cent.?	Gentile da Foligno, *Practical Medicine*	פרטיקה	Italian	Anonymous	Italy?
298	14th cent.?	Aegidius de Arelate, three short treatises about pregnancies	תחבושת למפלת (?)	Latin	Anonymous	Provence?
299	14th cent.?	Magister Gualtierus, *Flower of Medicine*	פרח הרפואה	Latin	Anonymous	?
300	14th cent.?	Guilielmus de Congenis, *Surgery*	ספר משרורגיאה	Latin	Jesaiah	Provence?
301	14th cent.?	Guilielmus de Saliceto, *Surgery* (1 and 2), books I–III	צירוגיאה; ספר צירוגיאה	Latin	Two anonymous translators	Italy?
302	14th cent.?	Guilielmus de Saliceto, *On Preservation and Cure*, introduction	(הקדמה למאמר הכללי)	Latin	Anonymous	Italy?
303	14th cent.?	Lanfrancus, *Short Surgery* and *Compendium of the Prescriptions (Antidotarium)*	אלנפרנקינא; באנטיטוטארי מעשה התרופות	Latin	Anonymous	?
304	14th cent.?	Lanfrancus, *Practical Medicine*, revised by Giovanni Passavanti	חכמה נשלמת במלאכת היד	Latin	Anonymous	?
305	14th cent.?	Matthaeus Gallus, *On Urine*	מאמר בסימני חלאים	Latin	Anonymous	?
306	14th cent.?	Maurus de Salerno, *On Urine* (1 and 2)	מראות השתן	Latin	Two anonymous translators	?
307	14th cent.?	Maurus de Salerno, *On Phlebotomy*	ספר הקזות	Latin	Anonymous	Spain or Italy
308	14th cent.?	Moskion (Muscio), *On Births* (*Gynaikeia*) (from Soranus), Latin trans.	ספר התולדת	Latin	Anonymous	?[150]
309	14th cent.?	Moskion (Muscio), *On Women's Medical Problems (Pessaria)*, Latin trans.	ספר דינה לכל ענין הרחם וחלייה	Latin	Anonymous	?[151]
310	14th cent.?	"Petrocellus," *On Cures* (1)	פיסיקא	Latin	Anonymous	?
311	14th cent.?	Peter of Spain, *Treasure of the Poor* (1, 2 and 3)	אוצר העניים; אוצר הדלים	Latin	Three anonymous translators	Italy and Portugal?

147 See Garcia-Ballestrer, Ferre, and Feliu, "Jewish Appreciation," pp. 91 and 104–7.

148 Ed. L. Ferre Cano, *Practica de Johannes de Parma. Un tratado farmacológico en sus versiones hebreas y catalana* (Granada, 2002).

149 See Ferre, "Las traducciones hebreas de la obra médica de Bernard de Gordon."

150 Ed. R. Barkai and trans. into French by M. Garel in R. Barkai, *Les Infortunes de Dinah, ou la gynécologie juive au Moyen Age* (Paris, 1991), pp. 129–284. According to Barkai, the text was translated by the pseudonymous Do'eg ha-'Edomi in Provence in 1197–9.

151 Ed. and trans. into English by Barkai, *A History of Jewish Gynaecological Texts*, pp. 97–108.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
312	14th cent.?	Johannes Platearius junior, *Practical Medicine*	ספר מדות	Latin	Anonymous	Italy?
313	14th cent.?	Raimundus Lullus, *The Tree of Science*, passage on the composition of medicines	מאמר למאישטרו ראמון בהרכבת הסמים	Latin	Anonymous	?
314	14th cent.?	Raimundus Lullus, *Book on the Secrets of Nature or "Quintae essentiae"*	מהמהות הה', הנקרא . . . קינטא אישנסיאה	Latin	Anonymous	?
315	14th cent.?	Ruggerus Panormitanus, *Surgery*	צירוגיא / מלאכת היד	Latin	Anonymous	Italy
316	14th cent.?	Ruggerus Panormitanus, as revised by Rolandus Capelluti, *"Rolandine" Surgery* (1 and 2)	ספר החבורות והנגעים; רולנדינה	Latin	Two anonymous translators	?
317	14th cent.?	Ruggerus Panormitanus, *Practical Medicine*	פרטיקה	Latin	Anonymous	?
318	14th cent.?	Theodoricus Borgognoni, *Surgery*	ספר רפואה	Latin	Anonymous	?
319	14th cent.?	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *Epistle about Forgetfulness* (2)	מאמר בשכחה ובמה שיוליד הזכרון	Arabic	Anonymous	?[152]
320	14th cent.?	Judah ben David Ḥayyuj, *Book of Hollow Verbs* (3)	(ספר פעלי הכפל)	Arabic	Anonymous	?
321	1302	Averroes, *Compendium of Aristotle's De partibus and De generatione animalium*	(באור ספר הבעלי חיים לארסטו)	Arabic	Jacob ben Makhir Ibn Tibbon	Provence[153]
322	after 1303	Bernardus de Gordon, *On the Grades of Medicine*	ספר המדרגות	Latin	Anonymous	?[154]
323	before 1304	Averroes, *On Purgatives*	שורשים כוללים	Arabic	Anonymous	Provence?
324	1306	(Pseudo?-)Abu Marwan Ibn Zuhr, *The Light in Medicine* (1)		Arabic	Jacob ben Makhir Ibn Tibbon (lost translation)	Spain?
325	after 1306?	(Pseudo?-)Abu Marwan Ibn Zuhr, *The Light in Medicine* (2)	המנורה ברפואה	Arabic	Samuel ben Solomon ben Natan	Provence?
326	after 1306?	Armengaudus Blasius, *Prescriptions (Antidotarium)*		Latin	Estori ben Moses ha-Parḥi	Spain (Barcelona)[155]

327	after 1306?	Anonymous, *On Evacuation*	ספר הכיבוסים	Latin	Estori ben Moses ha-Parḥi	Spain (Barcelona?)
328	1306–7	Ali Ibn Ridwan, *The Principles of Medicine*	ספר העמוד בשורשי הרפואה	Arabic	Qalonymos ben Qalonymos	Provence (Arles)
329	1307	Bernardus de Gordon, *On Phlebotomy*	המאמר בהקזה	Latin	Anonymous	Spain (Castellò d'Ampurias)[154]
330	1308	Galen, *Book on Clyster and Colic,* Arabic trans. by Ḥunayn Ibn Isḥaq	בחקנא ובקולנג	Arabic	Qalonymos ben Qalonymos	Provence
331	1308	Galen, *Treatise on Phlebotomy,* Arabic trans. by Istafan Ibn Basil and ʿIsa Ibn Yaḥya	ספר תכלית השימוש	Arabic	Qalonymos ben Qalonymos	Provence (Arles)
332	1309	Anonymous, *Treatise on the Five Regular Polyhedra*		Arabic	Qalonymos ben Qalonymos	Provence (Arles)[156]
333	1311	Thabit Ibn Qurra, *The Cutting Figure*	ספר התמונה החיתוכית	Arabic	Qalonymos ben Qalonymos	Provence[157]
334	1311	Abu Saʿdan (Abu Saʿd al-ʿAla Ibn Sahl?), *Booklet on the Triangle*	הדיבור המשולש	Arabic	Qalonymos ben Qalonymos	Provence[158]
335	1311	Anonymous, *Book on Geometrical Problems*	ספר משאלים בתשבורת	Arabic	Qalonymos ben Qalonymos	Provence[158]
336	1312	Ibn al-Samḥ, *Treatise on Cylinders and Cones*	מאמר באצטוונות והמחודדים	Arabic	Qalonymos ben Qalonymos	Provence[159]
337	ca. 1312?	Anonymous, *Resolution of the Doubts Concerning the Last Premise in Apollonius' Conic Sections*	ספר החרוטים	Arabic	Anonymous (Qalonymos ben Qalonymos?)	Provence[160]

[152] Ed. Bos, *Ibn al-Jazzar On Forgetfulness*, pp. 53–7. According to Bos, this translation should be assigned to an "early date" (p. 8).
[153] Ed. in progress by G. Bos and R. Fontaine.
[154] See Ferre, "Las traducciones hebreas de la obra médica de Bernard de Gordon."
[155] See Garcia-Ballestrer, Ferre, and Feliu, "Jewish Appreciation," p. 93 n. 38, where an edition by M. R. McVaugh and L. Ferre is said to be forthcoming.
[156] See Lévy, "The Establishment," p. 439; see also J. P. Hogendijk and Y. T. Langermann, "A Hitherto Unknown Hellenistic Treatise on the Regular Polyhedra," *Historia Mathematica* 11 (1984): 325–6.
[157] See Lévy, "The Establishment," p. 435.
[158] Ibid., p. 438.
[159] French trans. by T. Lévy, "Fragment d'Ibn al-Samh sur le cylindre et ses sections planes, conservé dans une version hébraïque," in R. Rashed, ed., *Les mathématiques infinitésimales du IXe au XIe siècle* (London, 1996), 1: 927–73, 1080–3; ed. by T. Lévy (forthcoming).
[160] See Lévy, "The Establishment," p. 439.

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338	1313	Averroes, *Middle Commentary on the Topics*	הבאור האמצעי לניצוח	Arabic	Qalonymos ben Qalonymos	Provence[161]
339	1313 (or 1322)	Averroes, *Middle Commentary on the Sophistics*	הבאור האמצעי להטעאה	Arabic	Qalonymos ben Qalonymos	Provence
340	ca. 1313	Pseudo-Aristotle, *Book of the Pure Good (Liber de causis)*, Latin trans. by Gerardus Cremonensis (3)	ספר הסבות / פרחי האלהיות	Latin	Judah Romano	Italy (Rome)[162]
341	ca. 1313	Albertus Magnus, *On the Causes and the Process of Universality* (*De causis et processu universitatis*), book II, 3, 2		Latin	Judah Romano	Italy (Rome)[163]
342	1314	Al-Fārābī, *On the Intellect* (3)	בשכל ומשכיל ומושכל	Arabic	Qalonymos ben Qalonymos	Provence
343	1314	Al-Ḥasan Ibn al-Haytham, *Commentary on the Premises of Euclid's Elements*, book X	פירוש פתיחת המאמר	Arabic	Qalonymos ben Qalonymos	Provence[164]
344	1314	Pseudo-Ptolemy (Abu Jaʿfar Aḥmad Ibn Yusuf), *Hundred Aphorisms (Centiloquium)* (2)	ספר הפרי לבטלמיוס . . . ונקרא מאה דבורים פירשו אבו געפר אחמד בן אברהים,	Arabic	Qalonymos ben Qalonymos	Provence (Arles)
345	1314	Al-Kindi, *On Natal Horoscopes*	אגרת בקיצור המאמר במולדות	Arabic	Qalonymos ben Qalonymos	Provence (Arles)
346	1314	Al-Kindi, *The Sufficient Treatise on Humidities and Rain* and *On the Causes Attributed to the Celestial Bodies*	אגרת המספקת בלחיות ובמטר, אגרת בעלות המיוחסות אל האישים העליונים	Arabic	Qalonymos ben Qalonymos	Provence (Arles)[165]
347	1314	Nicholas of Damascus, *De plantis*, Arabic trans. by Isḥaq Ibn Ḥunayn and Thabit Ibn Qurra	ספר הצמחים	Arabic	Qalonymos ben Qalonymos	Provence[166]
348	1314	Al-Fārābī, *Enumeration of the Sciences* (2)	מאמר במספר החכמות	Arabic	Qalonymos ben Qalonymos	Provence[167]

349	1314?	Al-Fārābī, *Propaedeutic to the Study of Philosophy*	אגרת בסדור קריאת החכמות	Arabic	Qalonymos ben Qalonymos	Provence[167]
350	1315	Jābir Ibn Aflaḥ, *The Cutting Figure*	הדבור בתמונה החיתוכית למילאוש	Arabic	Qalonymos ben Qalonymos	Provence[168]
351	1315?	Averroes, *Long Commentary on Aristotle's Physics*	(פירוש ספר השמע הטבעי לארסטו)	Arabic	Qalonymos ben Qalonymos	Provence
352	1315?	Averroes, *Long Commentary on Aristotle's Metaphysics* (1)	(פירוש ספר מה שאחר הטבע לארסטו)	Arabic	Anonymous (probably Qalonymos ben Qalonymos; ed. by Moses of Beaucaire)	Provence[169]
353	ca. 1315?	Averroes, *On the Substance of Heaven (De substantia orbis)*, anonymous Latin trans. (2)	ספר עצם השמים	Latin	Judah Romano	Italy (Rome)[170]
354	ca. 1315?	Albertus Magnus, *On Spirit and Breathing (De spiritu et respiratione)*	ספר הרוח והנשימה, חיבור האח הנכבד האשכנזי	Latin	Judah Romano	Italy (Rome)[171]
355	ca. 1315?	Albertus Magnus, *On the Soul (De anima)*, book III, treatises 1–2	ספר הנפש השלישי . . . חיבור החכם הגדול האשכנזי	Latin	Judah Romano	Italy (Rome)[172]

[161] See S. Rosenberg, "Logiqah we-'ontologiyah ba-filosofiyah ha-yehudit ba-me'ah ha-y"d," Ph.D. dissertation, Hebrew University of Jerusalem, 1973, 1: 85–6.

[162] Ed. J.-P. Rothschild in his Ph.D. dissertation, "Les traductions hébraïques du Liber de causis latin," 2 vols., University of Paris, 1985. See idem, "Les traductions du *Livre des causes*."

[163] Ed. J.-P. Rothschild, "Un traducteur hébreu qui se cherche: R. Juda ben Moise Romano et le *De causis et processu universitatis, II,3,2* d'Albert le Grand," *Archives d'histoire doctrinale et littéraire du Moyen Age* 59 (1992): 159–73.

[164] See Lévy, "The Establishment," p. 434.

[165] Ed. G. Bos, in G. Bos and C. Burnett, *Scientific Weather Forecasting in the Middle Ages: The Writings of al-Kindi* (London, 1998).

[166] Ed. in H. J. Drossaart Lulofs and E. L. J. Poortman, *Nicolaus Damascenus De Plantis. Five Translations* (Amsterdam, 1989), pp. 407–36.

[167] Ed. and Italian trans. by M. Zonta, *La Classificazione delle scienze di al-Farabi nella tradizione ebraica* (Turin 1992).

[168] See Lévy, "The Establishment," p. 435.

[169] See Zonta, *La filosofia antica*, pp. 242–3; idem, "Sulla tradizione ebraica di alcuni commenti arabi alla *Metafisica* (Abū l-Farag Ibn al-Tayyib e Averroè)," *Documenti e studi sulla tradizione filosofica medievale* 12 (2001): 155–77.

[170] Ed. C. Rigo in her Ph.D. dissertation, "Il *De substantia orbis* di Averroè: edizione della versione latino-ebraica con commento di Yehudah ben Mosheh Romano," University of Turin, 1992.

[171] Ibid., p. 160.

[172] Ibid., pp. 158–9.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
356	ca. 1315?	Dominicus Gundisalvus, *On One and Unity (De uno et unitate)* (falsely ascribed to Boethius)	מאמר האחד והאחדות, חיבור החכם בואיציאוס	Latin	Judah Romano	Italy (Rome)[173]
357	1316	Averroes, *Middle Commentary on Aristotle's Physics* (2)	(ביאור ספר השמע הטבעי לארסטו)	Arabic	Qalonymos ben Qalonymos	Provence[174]
358	1316	Averroes, *Middle Commentary on Aristotle's De generatione*	(ביאור ספר ההויה וההפסד לארסטו)	Arabic	Qalonymos ben Qalonymos	Provence[175]
359	1316	"Brethren of Purity" (Abu l-Qasim Maslama al-Majriti?), *Epistle* 22 (second part)	אגרת בעלי חיים	Arabic	Qalonymos ben Qalonymos	Provence[176]
360	1316	Averroes, *Middle Commentary on Aristotle's Meteorology*	ביאור ספר האותות העליונות	Arabic	Qalonymos ben Qalonymos	Provence[177]
361	1317	Averroes, *Middle Commentary on Aristotle's Metaphysics* (2)	(ביאור ספר מה שאחר הטבע לארסטו)	Arabic	Qalonymos ben Qalonymos (then revised by the translator himself)	Provence[178]
362	1317	Nicomachus of Gerasa, *Introduction to Arithmetic*, Arabic trans. by Ḥabib Ibn Bahriz, plus additions by others (including al-Kindi)	ספר האריתמאתיקא	Arabic	Qalonymos ben Qalonymos	Provence[179]
363	ca. 1317?	Archimedes, *The Sphere and the Cylinder*, Arabic trans. by Qusta Ibn Luqa	בכדור ובאצטוונה	Arabic	Qalonymos ben Qalonymos (two versions)	Provence[180]
364	ca. 1317?	Eutocius, *Commentary on Archimedes' Sphere and Cylinder*, Arabic trans.		Arabic	Qalonymos ben Qalonymos?	Provence[181]

365	1317?	Ptolemy, *Planetary Hypotheses*, Arabic trans. revised by Thabit Ibn Qurra?	בספור עניני הכוכבים הנבוכים	Arabic	Qalonymos ben Qalonymos	Provence[182]
366	1318	Anonymous, *Commentary on Menelaus' Spherics*		Arabic	Samuel ben Judah of Marseilles	Provence[183]
367	after 1319	Al-Mu'taman Ibn Hud, *The Perfectionment*, section including a version of Thabit Ibn Qurra, *On Amicable Numbers*		Arabic	Qalonymos ben Qalonymos	Provence[184]
368	before 1320	Thomas Aquinas, *On Being and Essence (De ente et essentia)*	מאמר הנמצא והמציאות, חיבור האח הנכבד הדורש	Latin	Judah Romano	Italy (Rome)[185]
369	before ca. 1320	Isaac Israeli, *Book of Urines* (4)	ספר מחובר במאמרי הראשונים בידיעת השתן	Arabic	Anonymous	?
370	1320	Anonymous, *Commentary on Peter of Spain's Tractatus*	טרקטאש לפטרוס היספנוס	Latin	Hezekiah bar Ḥalafta	Provence[186]

[173] Ibid., p. 164.

[174] Books 1 and 2 were edited, translated into English, and studied by S. Harvey in his Ph.D. dissertation (above, n. 114); ed. in progress by R. Glasner. According to Glasner (personal communication), there is a third Arabic-to-Hebrew translation of book VIII, part 2, chapters 1 and 2 of this work, in addition to those by Zeraḥiah and Qalonymos, by a certain "Narwinio" or "Garwino," executed between 1316 and 1350.

[175] Ed. Kurland, *Averrois Cordubensis.*

[176] First ed.: Qalonymos ben Qalonymos, *'Iggeret ba'alei ḥayyim* (Mantua, 1557). This is a revised version of the second section of the Arabic original text.

[177] Ed. I. M. Levey in his Ph.D. dissertation, "The Hebrew Commentary of Averroes on Aristotle's *Meteorologica*: Hebrew Translation of Kalonymos ben Kalonymos," Harvard University, 1947.

[178] Ed. in progress by M. Zonta. See the provisional edition by M. Zonta in his Ph.D. dissertation, "La tradizione ebraica del 'Commento medio' di Averroè alla Metafisica di Aristotele," University of Turin, 1955, published Pavia 2011.

[179] See a recent study and partial critical edition by G. Freudenthal and T. Lévy, "De Gérase à Bagdad: Ibn Bahrîz, al-Kindî, et leur recension arabe de l'Introduction arithmétique de Nicomaque, d'après la version hébraïque de Qalonymos ben Qalonymos d'Arles," pp. 481–543 in R. Morelon and A. Hasnawi, eds., *De Zénon d'Elée à Poincaré. Recueil d'études en hommage à Roshdi Rashed* (Louvain and Paris, 2004).

[180] See Lévy, "The Establishment," p. 436 n. 12.

[181] See Lévy, "The Establishment," p. 437.

[182] See B. R. Goldstein, "The Arabic Version of Ptolemy's *Planetary Hypotheses*," *Transactions of the American Philosophical Society* n.s. 57/4 (1967): 3–55.

[183] See Lévy, "The Establishment," p. 434.

[184] See Lévy, "The Establishment," p. 437; see also idem, "L'histoire des nombres amiables: le témoignage des textes hébreux médiévaux," *Arabic Sciences and Philosophy* 6 (1996): 63–87, on pp. 78–82.

[185] Ed. G. Sermoneta, "Sancti Thomae de Aquino Opusculum de ente et essentia a Rabbi Jehudàh ben Mosèh ben Dani'èl Romano primum hebraice redditum (saec. XIV ineunte)" (in Hebrew), in A. Z. Bar-On, ed., *From Parmenides to Contemporary Thinkers: Readings in Ontology* (in Hebrew), Vol. 1 (Jerusalem, 1978), pp. 184–214.

[186] See M. Zonta, "Fonti antiche e medievali della logica ebraica nella Provenza del Trecento," *Medioevo* 23 (1997): 515–94, esp. pp. 583–94.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
371	1320	Averroes, *Logical Questions*	שאלות דבריות לאבן רשד	Arabic	Samuel ben Judah of Marseilles	Provence[187]
372	ca. 1320	Averroes, *Logical Question IX*	שאלות דבריות לאבן רשד; חבור האפשרי וההכרחי בתמונה הראשונה	Arabic	Qalonymos ben Qalonymos	Provence[187]
373	ca. 1320	Abu al-Qasim ben Idris, *The Logical Questions of the Philosophers*	השאלות הדבריות . . . אשר לפלוסופים	Arabic	Samuel ben Judah of Marseilles	Provence[188]
374	ca. 1320	Abu al-Ḥajjaj Ibn Talmus, *The Logical Questions of the Philosophers*	השאלות הדבריות . . . אשר לפלוסופים	Arabic	Samuel ben Judah of Marseilles	Provence[188]
375	ca. 1320	Abu al-ʿAbbas Aḥmad ben Qasim, *The Logical Questions of the Philosophers*	השאלות הדבריות . . . אשר לפלוסופים	Arabic	Samuel ben Judah of Marseilles	Provence[188]
376	ca. 1320	ʿAbd al-Raḥman ben Tahir, *The Logical Questions of the Philosophers*	השאלות הדבריות . . . אשר לפלוסופים	Arabic	Samuel ben Judah of Marseilles	Provence[188]
377	after ca. 1320?	Dino Del Garbo, *Surgery (Prescriptions)*	ספר צירוגיאה ומעשה התחבושת מדינו	Latin	Anonymous	Italy?
378	1320–5	Averroes, *Long Commentary on Aristotle's Metaphysics* (2)	(פירוש ספר מה שאחר הטבע לארסטו)	Arabic	Moses of Beaucaire (revised version of the previous translation by Qalonymos ben Qalonymos)	Provence[189]
379	ca. 1320–30	Thomas Aquinas, *Summa Theologiae*, part I, question 15 ("on ideas")	מאמר בהמשלים . . . לחכם טומסו דאקוינו	Latin	Judah Romano	Italy (Rome)[190]
380	ca. 1320–30	Thomas Aquinas, *Opuscule on Fallacies*, introduction	מאמר ההטעאה ממלאכת ההגיון לחכם טומס מאקינו	Latin	Judah Romano	Italy (Rome)[191]
381	ca. 1320–30	Pseudo-Thomas Aquinas, *Treatise on the Faculties of the Soul*	מאמר הבדלי כוחות הנפש וחילוקיהם בקיצור, חיבור האח הנכבד הדורש	Latin	Judah Romano	Italy (Rome)[192]
382	ca. 1320–30	Giles of Rome, *Commentary on Aristotle's De anima*, book III	ספר הנפש השלישי לאביר הפילוסופים אריסטוטילס עם ביאור האח הנכבד איאידיוס	Latin	Judah Romano	Italy (Rome)[193]

383	ca. 1320–30	Giles of Rome, *On the Plurification of Possible Intellect*	מאמר ספירת השכל לאח הנכבד איאידיוס	Latin	Judah Romano	Italy (Rome)[194]
384	ca. 1320–30	Pseudo-Giles of Rome, *On the Faculties of the Human Soul*	מאמר קצר בחכמה נפשית, חיבור החכם איאידיוס	Latin	Judah Romano	Italy (Rome)[195]
385	ca. 1320–30	Pseudo-Giles of Rome, *On Simple and Mixed Syllogisms in Each Figure*	מאמר הווית ההקשים הפשוטה והמעורבת בכל תמונה, חיבור האח הנכבד	Latin	Judah Romano	Italy (Rome)[195]
386	ca. 1320–30	Giles of Rome, *Commentary on Aristotle's Physics*, book IV, third part (*lectiones* 18–28)	מאמר הזמן שהוא החלק השלישי מהמאמר הרביעי מספר השמע לאביר הפילוסופים אריסטוטילס עם ביאור האח הנכבד איאידיוס	Latin	Judah Romano	Italy (Rome)[196]
387	ca. 1320–30	Giles of Rome, *Theorems on Being and Essence*, I–VIII	ספר הישות והמהות לאח הנכבד איאידיאוס	Latin	Judah Romano	Italy (Rome)[197]
388	ca. 1320–30	Albertus Magnus, *Summa de creaturis*, part II, treatise 1, question 21	מאמר הצורה הנחקקת במראה	Latin	Judah Romano	Italy (Rome)[198]
389	ca. 1320–30	Giles of Rome, *Commentary on Demonstration*	מאמר הגיוני לאיאדיאוס על ספר המופת	Latin	Judah Romano	Italy (Rome)[199]
390	ca. 1320–30	Giles of Rome, *Commentary on Rhetoric*	מאמר . . . על חכמת ההלצה	Latin	Judah Romano	Italy (Rome)[199]
391	ca. 1320–30	Pseudo-Thomas Aquinas, *De fallaciis*	מאמר לחכם הגדול טומשו מאקוינו	Latin	Judah Romano	Italy (Rome)[199]

187 See Rosenberg, *Logiqah we-ontologiyah*, 1: 59–62.
188 See ibid., pp. 68–9.
189 See Zonta, *La filosofia antica*, p. 243; idem, "Sulla tradizione ebraica di alcuni commenti arabi alla *Metafisica*."
190 See G. Sermoneta, "Jehudah ben Moseh ben Dani'el Romano, traducteur de saint Thomas," pp. 235–62 in G. Nahon and C. Touati, eds., *Hommage à Georges Vajda* (Louvain, 1980), on p. 246.
191 See Sermoneta, "Jehudah ben Moseh ben Dani'el Romano," p. 262.
192 See Rigo, "Yehudah ben Mosheh Romano," pp. 168–9.
193 See ibid., p. 433.
194 See ibid., p. 435.
195 See ibid., p. 434. The Latin source of this translation has not yet been found.
196 See ibid., p. 432.
197 See ibid., p. 436.
198 See ibid., pp. 160–1.
199 See C. Rigo, "Un'antologia filosofica di Yehuda ben Mosheh Romano," *Italia* 10 (1993): 73–104.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
392	ca. 1320–30	Angel of Camerino, *Commentary on the Categories*	מאמר הגיוני לאח הנכבד אניילוס . . .	Latin	Judah Romano	Italy (Rome)[199]
393	ca. 1320–30	Angel of Camerino, *Commentary on De interpretatione*	מאמר הגיוני לאח הנכבד אניילוס . . .	Latin	Judah Romano	Italy (Rome)[199]
394	ca. 1320–40	Ibn Bajja, *Letter of Farewell*	מאמר הנמשך לאגרת	Arabic	Ḥayyim Ibn Vivas	Spain[200]
395	1320–1	Averroes, *Compendium of Plato's Republic*	הפשטת מה שיכללוהו המאמרים המיוחסים לאפלטון בהנהגת המדינה	Arabic	Samuel ben Judah of Marseilles	Provence (Beaucaire)[201]
396	1321	Averroes, *Middle Commentary on Aristotle's Nicomachean Ethics*	(ביאור ספר המדות לארסטו)	Arabic	Samuel ben Judah of Marseilles	Provence (Beaucaire)[202]
397	1322	Al-Ḥasan Ibn al-Haytham, *On the Configuration of the World* (2)	(מאמר בתכונה)	Arabic	Solomon Ibn Pater of Burgos	Spain[203]
398	1322	*Alexandrian Compendia of Galen's Sixteen Works*, Arabic trans. by Ḥunayn Ibn Isḥaq	ספר הקיצורים לאלכסדריים	Arabic	Samson ben Solomon	Provence?[204]
399	1323	Alexander of Aphrodisias, *On the Soul*, book I, Arabic trans. by Isḥaq Ibn Ḥunayn (1)	ספר הנפש	Arabic	Samuel ben Judah of Marseilles	Spain (Murcia)
400	shortly before 1328	Averroes, *Incoherence of the Philosophers* (1)	(הפלת ההפלה)	Arabic	Qalonymos Todrosi	Provence[205]
401	1327	Arnaldus de Villanova, *The Regimen of Health* (2)	מאמר בהנהגת הבריאות	Latin	Israel ben Joseph ha-Levi Caslari	Provence (Avignon)[206]
402	ca. 1327	Arnaldus de Villanova, *"Arnaldina"*	ארנבדינגא	Latin	Israel ben Joseph ha-Levi Caslari	Provence (Avignon?)
403	before 1330 (or 1320–50)	Abu Ḥamid al-Ghazali, *Intentions of the Philosophers* (2) (two times)	כוונות הפילוסופים	Arabic	Judah ben Solomon Natan	Provence[207]
404	1329	Averroes, *Epitome of the Organon*	קיצור מכל מלאכת הגיון	Arabic	Samuel ben Judah of Marseilles	Provence[208]
405	ca. 1330	Averroes, *Middle Commentary on the Organon*	ביאור להגיון	Arabic	Samuel ben Judah of Marseilles	Provence[209]
406	ca. 1330	al-Fārābī, *Treatise on Rhetoric*	ספר ההלצה	Arabic	Todros Todrosi?	Provence[210]

407	ca. 1330	al-Fārābī, *Treatise on Poetics*	ספר השיר	Arabic	Todros Todrosi?	Provence[210]
408	ca. 1330	(Pseudo-)al-Fārābī (Avicenna?), *The Sources of Questions*	עין משפט הדרושים	Arabic	Todros Todrosi	Provence
409	after 1331?	Joseph ben Isaac Israeli, *Compendium of Isaac Israeli's Foundation of the World*	קיצור יסוד עולם	Arabic	Isaac Israeli (obviously not the philosopher)	Spain (Toledo?)
410	1330–40	Avicenna, *The Salvation*, sections on physics and metaphysics	הצלת הנפש	Arabic	Todros Todrosi	Provence
411	1330–40	Averroes, three metaphysical questions, one of which corresponds to the *Physical Question* n. 9	מאמר לאבן רשד השגה על אבן סינא בחלקו הנמצאות; מאמר לאבן רשד הוראה לאבן סינא על מה שהשיג עליו במאמר הקודם; מאמר בדעת הקדום	Arabic	Todros Todrosi	Provence[211]
412	1334	Fakhr al-Din al-Razi, *Eastern Investigations, Demonstration*	ליקוטים	Arabic	Todros Todrosi	Provence[212]
413	1334	al-Fārābī, *Treatises on Logic, Long Commentary on book VIII of the Topics*	ליקוטים	Arabic	Todros Todrosi	Provence[212]
414	1334	Avicenna, *The Cure (on Parts of the Syllogism and Demonstration)*	ליקוטים	Arabic	Todros Todrosi	Provence[212]
415	1334	Themistius, *Paraphrase of the Syllogism*	ליקוטים	Arabic	Todros Todrosi	Provence[212, 213]
416	1334	Al-Ghazali, *Criterion of Knowledge*	ליקוטים	Arabic	Todros Todrosi	Provence[212]

[200] Ed. M.-R. Hayoun, "Moses of Narbonne and Ibn Bajja (II): The Hebrew version of the *Epistle of Farewell*" (in Hebrew), *Da'at* 25 (1990): 93–125.

[201] Ed. E. I. J. Rosenthal, *Averroes' Commentary on Plato's Republic* (Cambridge, 1956).

[202] Ed. L. V. Berman, *Averroes, Middle Commentary on Aristotle's Nicomachean Ethics in the Hebrew Version of Samuel ben Judah* (Jerusalem, 1999).

[203] See Lévy, "The Establishment," pp. 435–6 (where the existence of other two anonymous Hebrew translations of this work is mentioned).

[204] See E. Lieber, "Galen in Hebrew: The Transmission of Galen's Works in the Medieval Islamic World," pp. 167–86 in V. Nutton, ed., *Galen: Problems and Prospects* (London, 1981).

[205] Ed. in progress by A. Shahlan.

[206] See Garcia-Ballestrer, Ferre, and Feliu, "Jewish Appreciation," pp. 102–5 (ed. of the Hebrew introduction and trans. into English).

[207] See S. Harvey, "Why Did Fourteenth-Century Jews Turn to Alghazali's Account of Natural Science?" *Jewish Quarterly Review* 91 (2000): 359–76. For the date, see Zonta, *La filosofia antica*, pp. 249–50, and the different proposal in C. Manekin, "The Logic of the Encyclopedias," pp. 277–300 in S. Harvey, ed., *Medieval Hebrew Encyclopedias of Science and Philosophy* (Dordrecht, 2000), esp. pp. 288–99.

[208] Zonta, *La filosofia antica*, pp. 245–7.

[209] Ibid., p. 238. The revised translation of the *Isagoge* is cited in Judah ben Isaac Cohen's supercommentary on the *Isagoge* and the *Categories* (ca. 1340).

[210] See G. Tamani, "La versione ebraica del *Compendio della logica* di al-Fārābī: la retorica e la poetica," *Henoch* 16 (1994): 253–69. The attribution to Todrosi is uncertain.

[211] See Rosenberg, "The Hebrew Translations of Averroes' *Physical Questions*," p. 719.

[212] On the excerpts of this work, found in Todrosi's anthology, see Zonta, *La filosofia antica*, pp. 252–3.

[213] Ed. S. Rosenberg and C. H. Manekin, "Japhet in the Tents of Shem: Greek Philosophy Preserved in Hebrew" (in Hebrew), in *Jerusalem Studies in Jewish Thought* 9 (1990): 267–75. English trans. by S. Rosenberg and C. H. Manekin, "Themistius on Modal Logic: Excerpts of a Lost Commentary on the Prior Analytics," *Jerusalem Studies in Arabic and Islam* 11 (1988): 83–103.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
417	1334	Averroes, *Long and Middle Commentaries on Demonstration, Middle Commentary on the Topics*	ליקוטים	Arabic	Todros Todrosi	Provence[212]
418	1335	Jābir Ibn Aflaḥ, *Correction of Ptolemy's Almagest* (4)	קיצור מגיסטי	Arabic	Samuel ben Judah of Marseilles' revision of Jacob ben Makhir Ibn Tibbon's version	Provence (Aix)
419	1335–40?	Abu ʿAbdallah Ibn Muʿadh, *On the Twilight* and *On the Rising Clouds*	אגרת בקדרות השמש; אגרת בעמוד השחר	Arabic	Samuel ben Judah of Marseilles	Provence[214]
420	1335–40?	Ibrahim al-Zarkali, *On the Movement of Fixed Stars*	מאמר בתנועת הכוכבים הקיימים	Arabic	Samuel ben Judah of Marseilles	Provence
421	before 1337	Galen, *On Different Kinds of Bad Temperament*, Latin trans. by Gerardus Cremonensis	ספר רוע מזג מתחלף	Latin	David ben Abraham Caslari	Provence (Narbonne or Montpellier)
422	1337	Averroes, *Middle Commentary on the Rhetoric*	הבאור האמצעי להלצה	Arabic	Todros Todrosi	Provence[215]
423	1337	Averroes, *Middle Commentary on the Poetics*	הבאור האמצעי לשיר	Arabic	Todros Todrosi	Provence[216]
424	1338	Johannes Pauli, *The Health of Life*	מאמר בסגולת עור הנחש (בריאות החיים)	Latin	David ben Yom Ṭov Ibn Bilia	Provence (Perpignan?)
425	before 1340	Averroes, *Commentary on Alexander of Aphrodisias' On the Intellect*	מאמר אלכסנדר בשכל עם פירוש בן רשד	Arabic	Anonymous (trans. commented by Moses Narboni)	Provence?[217]
426	1340	Alexander of Aphrodisias, *On the Soul*, book I, Arabic trans. by Isḥaq Ibn Ḥunayn (2)	מאמר בנפש	Arabic	Samuel ben Judah of Marseilles (revision of the previous trans.)	Provence (Montélimar)[218]
427	before 1344	Abu Ḥamid al-Ghazali, *Intentions of the Philosophers* (3)	כוונות הפילוסופים	Arabic	Anonymous	Provence?[219]

428	1347 or before	Averroes, *Incoherence of the Philosophers* (2)	הפלת ההפלה	Arabic	Anonymous (the archetype was copied by Moses Narboni; was he the translator?)	Provence?
429	ca. 1347	Abu ʿAbdallah Muḥammad al-Tabrizi, *Commentary on the 25 Propositions of Maimonides' Guide of the Perplexed* (2)	פירוש כ"ה הקדמות	Arabic	Isaac Natan	Spain (Majorca)[220]
430	after 1348	Gentile da Foligno, *(Medical) Advice*	עצה	Latin	Joshua of Bologna?	Italy?
431	1349 or before	Ibn Tufayl, *Living Son of Awake*	אגרת חי בן יקט'אן	Arabic	Anonymous (known only through Moses Narboni's commentary)	Provence?[221]
432	1352 or before	ʿUmayya Ibn Abi l-Salt, *Book of Simple Medicines*	כלל קצר מהסמים הנפרדים	Arabic	Judah ben Solomon Natan (translation revised by Natan ben Shelemiah)	Provence[222]
433	after ca. 1350	Franciscus de Bononia, *Consultation about the Plague*	עצה . . . על הדבר	Latin	Joshua of Bologna	Italy (Bologna?)
434	after ca. 1350	Paulus de Sophia (Spira?), *On Plague*	(הנהגה בדבר?)	Latin	Anonymous	?

[214] Ed. B. R. Goldstein, in A. Mark Smith and B. R. Goldstein, "The Medieval Hebrew and Italian Versions of Ibn Muʿadh's *On Twilight and the Rising of Clouds*," *Nuncius* 8 (1993): 611–43. See also Goldstein's English translation, "Ibn Muʿadh's Treatise *On Twilight and the Height of the Atmosphere*," *Archive for History of Exact Sciences* 17 (1977): 97–118.

[215] Ed. J. Goldenthal, *Be'ur Even Rošd le-Sefer ha-Halaṣah* (Leipzig, 1842).

[216] Ed. F. Lasinio, *Il Commento medio di Averroè alla Poetica di Aristotele* (Pisa, 1872), Vol. 2.

[217] Ed. H. A. Davidson in "Averroes' Commentary on Alexander of Aphrodisias' *De intellectu*" (in Hebrew), *Jerusalem Studies in Jewish Thought* 7 (1988): 205–17. On the Judeo-Arabic tradition of the original Arabic text and its Hebrew version, see M. Zonta, "La tradizione giudeo-araba ed ebraica del *De intellectu* di Alessandro di Afrodisia e il testo originale del *Commento* di Averroè," *Annali di Ca' Foscari* 40 s.or. 32 (2001): 17–35.

[218] See the first section of the translation in A. Guensz, *Die Abhandlung Alexanders von Aphrodisias ueber den Intellekt* (Berlin, 1886). See also M. Steinschneider's comparison of the Hebrew variant readings and the Greek text, in I. Bruns, *Alexander Aphrodisiensis De anima cum mantissa* (Berlin, 1887).

[219] Ed. and English trans. by G. Chertoff, "The Logical Text of al-Ghazālī's *Maqāsid al-Falāsifa*," Ph.D. dissertation, Columbia University, 1952. See also Harvey, "Why Did Fourteenth-Century Jews Turn to Alghazali's Account of Natural Science?"

[220] Ed. in *Peruš ha-k"w* [sic] *haqdamot* . . . (Venice, 1574).

[221] Ed. of Narboni's commentary by M.-R. Hayoun, "Moses Narbonis Kommentar zum Hayy ibn Yaqzan des ibn Tufayl," *Terumah* 12 (2002), entire Hebrew section; ed. of Hebrew translation by Y. Shiffman, in progress.

[222] Ed. M. Steinschneider, *Israelitische Letterbode* 8 (Amsterdam, 1883), pp. 189ff.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
435	after ca. 1350 and before 1399	Johannes cum barba (Cenobarba?), *(Medical) Advice*	עצה	Latin	Anonymous	?
436	1352	ʿAbd al-Raḥim Ibn Wafid, *Book of Simple Medicines* and *Practical Medicine*	מראשית הראש; גורדון קצר	Arabic	Judah ben Solomon Natan	Provence
437	before ca. 1356	Moses Maimonides, *On Asthma* (2)	ספר הקצרת	Arabic	Samuel Benveniste	Spain (Aragon)[223]
438	1358	Arnaldus de Villanova, *On Wine*	הדבור ביינות	Latin	Judah ben Solomon Natan	Provence
439	second half of 14th cent.	Ibn Abi l-Rijal, *Complete (Astronomical) Treatise*, Latin trans. by Egidio de' Tebaldi (1)	משפטי הכוכבים	Latin	Solomon Davin of Rodez (two versions)	Provence
440	second half of 14th cent.	Anonymous, *Parisian Tables*	לוחות פאריש	Latin	Solomon Davin of Rodez	Provence
441	second half of 14th c.ent	Guy de Chauliac, *Great Book of Surgery*	(כירורגיה)	Latin	Anonymous	?
442	1360	Bernardus de Gordon, *Lily of Medicine* (1)	פרח הרפואות	Latin	Moses ben Samuel of Roquemaure	Spain (Sevilla)[224]
443	after 1360?	Joseph ben Abraham Ibn Waqar, *Treatise Reconciling Philosophy and Religious Law*	ספר הסכמת הפילוסופים והאצטגנינים והמקובלים	Arabic	Anonymous	Spain?[225]
444	1362?	Gilbertus Anglicus, *Medical Compendium*	קיצורי הרפואות	Latin	Judah ben Solomon Natan?	Provence?
445	after 1364	Johannes Jacobi, *Secret of Medicine* (1)	סוד המלאכה / פרטיקה	Latin	Anonymous	?
446	ca. 1370	Abraham Ibn Daud, *The Exalted Faith* (1)	האמונה הרמה	Arabic	Solomon Ibn Labi	Spain[226]
447	1370	Ibn al-Sid al-Batalyawsi, *Book of the Intellectual Spheres*, chapters 1–4		Arabic	Samuel Ibn Motot (in his commentary on the *Book of Creation*)	Spain (Guadalajara)[227]

448	ca. 1370–1400	Bernardus Alberti, *Introduction to the Art (of Medicine)*	מבוא במלאכה	Latin	Abraham Avigdor	Provence (Montpellier?)
449	after 1370	Johannes cum barba (Cenobarba?), *On Plague*	עזר אלה / בעיפוש האויר והדבר	Latin	Benjamin ben Isaac of Carcassonne	Provence (Carcassonne?)
450	ca. 1375	"Bryson," *Economics*, Arabic trans.	סדר הנהגת האדם בביתו	Arabic	David ben Solomon Ibn Yaʿish	Spain (Seville)[228]
451	1378	Jacob al-Corsono, *Astrolabe*	ביאור עשית אצטורלב	Arabic	Jacob al-Corsono (the author himself)	Spain (Seville)
452	1378?	Arnaldus de Villanova, *Parabolas*	פרקי ארנבט דווילא נובא	Latin	Abraham Avigdor?	Provence?[229]
453	1379	Gerardus de Solo, *On Fevers*	מבוא הנערים (?)	Latin	Abraham Avigdor	Provence (Montpellier)[230]
454	around 1380	Georgios Khrysokokkas, *The Persian Tables*	מהלך הכוכבים	Greek	Solomon ben Elijah	Greece (Saloniki)[231]
455	1379–90	Moses Maimonides, *On Asthma* (3)	ספר הקצרת	Arabic	Joshua Shatibi of Jativa	Spain (Castile: Toledo?)[232]
456	around 1380?	(Pseudo-)Ptolemy, *Astrolabe*, Arabic translation	מהלך הכוכבים	Arabic	Anonymous (Solomon ben Elijah?)	Greece?

[223] Ed. S. Muentner, *Rabbenu Mošeh ben Maimon, Sefer ha-Qaṣṣeret* . . . (Jerusalem, 1940); rev. ed. in idem, *Bi-refu'at ha-ṭeḥorim*, pp. 66–119; new critical ed. by Bos, *Maimonides On Asthma*, 2: 241–316.

[224] See Ferre, "Las traducciones hebreas de la obra médica de Bernard de Gordon."

[225] On the extant sections of this Hebrew translation, see G. Vajda, *Recherches sur la philosophie et la kabbale dans la pensée juive du Moyen Age* (Paris and The Hague, 1962), p. 119.

[226] Ed. and English trans. by G. Weiss and N. M. Samuelson, *Abraham Ibn Daud, The Exalted Faith* (Cranbury, NY and London, 1986); a new critical edition, by A. Eran and R. Fontaine, is in progress.

[227] This partial translation (in reality, part of a commentary by Motot on the *Sefer Yeṣirah*) was edited in D. Kaufmann, *Die Spuren al-Batlajusi's in der jüdischen Religionsphilosophie* (Budapest, 1880), entire Hebrew section.

[228] Ed. M. Plessner, *Der OIKONOMIKOS des Neupythagoraeers Bryson und sein Einfluss auf die islamische Wissenschaft* (Heidelberg, 1928), pp. 145–203.

[229] Ed. L. Ferre and E. Feliu in Arnaldi de Villanova, *Opera medica omnia, VI.1, Medicationis parabole . . . Pirqey Arnavt de-Villa Nova, Pirqé Arnau de Vilanova* (Barcelona, 1990).

[230] Ed. L. Ferre, "La versión hebrea del tratado *De febribus* de Gerard de Solo," *Miscelánea de estudios árabes y hebraicos, sección hebrea* 45 (1996): 149–83.

[231] See B. R. Goldstein, "The Survival of Arabic Astronomy in Hebrew," *Journal for the History of Arabic Science* 3/1 (1979): 31–9, on pp. 36–7.

[232] Ed. Bos, *Maimonides On Asthma*, 2: 319–83.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
457	1381	Arnaldus de Villanova, *On the Judgments in Astronomy* (1) (summarized)	מאמר . . . במשפטי הכוכבים	Latin	Jacob ben Judah Cabret	Spain (Barcelona)
458	1381	Arnaldus de Villanova, *On Digestive and Purgative Things* (1)	מגלה	Latin	Abraham Avigdor	Provence (Montpellier)
459	1387	Bernardus de Gordon, *Lily of Medicine* (2)	שושן הרפואה	Latin	Jekutiel ben Solomon (Bonsenyor Salamon) of Narbonne	Provence (Perpignan)[233]
460	before ca. 1390	Gerardus de Solo, *Commentary on Book IX of al-Razi's "Aided Doctor" (al-Mansuri)* (1)	מבוא	Latin	Abraham Avigdor	Spain (Montpellier)
461	1391	Abraham Ibn Daud, *The Exalted Faith* (2)	האמונה הנשאה	Arabic	Samuel Ibn Motot	Spain[234]
462	ca. 1392–1402	Pseudo-Hippocrates, *Astrology* (1)	(האבחנה הרפואית לפי מקום המבנה)	Latin (or Arabic?)	Leon Joseph of Carcassonne	Provence (Carcassonne)
463	ca. 1392–1402	Johannes de Tornamira, *Commentary on Book IX of al-Razi's "Aided Doctor" (al-Mansuri)* and *On Urines*	ספר הזיכוך (קלאריפיקאטורי)	Latin	Leon Joseph of Carcassonne	Provence (Carcassonne)
464	1393	Arnaldus de Villanova, *On the Judgments of Astronomy* (2)	פנים במשפט	Latin	Solomon Avigdor, assisted by his father Abraham Avigdor	Provence (Montpellier?)
465	1394	Arnaldus de Villanova, *On Digestive and Purgative Things* (2)	שערי ההרכבות	Latin	Todros ben Moses Yom Ṭov "Bondia"	Provence (Avignon?)
466	1394	Peter of Spain, *Treasure of the Poor*, chapters on fever	סודות הקדחות	Latin	Todros (ben) Moses (Yom Ṭov) "Bondia"	Provence (Avignon?)
467	1394–1402	Gerardus de Solo, *Commentary on Book IX of al-Razi's "Aided Doctor" (al-Mansuri)* (2)	מבוא	Latin	Leon Joseph of Carcassonne	Provence (Carcassonne)[235]

468	1394–1402?	Gerardus de Solo, *Introduction to the Beginners*	מישר המתחילים	Latin	Leon Joseph of Carcassonne	Provence (Carcassonne?)
469	1395	ʿUmayya Ibn Abi l-Salt, *Encyclopedia*, section on arithmetic (corresponding to Avicenna, *The Cure*, section on arithmetic)		Arabic	Benveniste Ibn Labi	Spain (Saragossa)[236]
470	1395–6	Joseph ben Isaac Ibn Waqar, *Astronomical Tables*	לוחות תכונה	Arabic	Joseph ben Isaac Ibn Waqar (the author himself)	Spain (Toledo)[237]
471	1399	John Holywood (Johannes de Sacrobosco), *The World's Sphere*	מראה האופנים	Latin	Solomon Avigdor	Provence
472	after 1396	Aḥmad Ibn Muḥammad Ibn al-Banna, *Compendium of the Arithmetical Rules*	מסיר המסוה	Arabic	Isaac al-Aḥdab	Italy (Sicily: Syracuse?)[238]
473	before 1400?	Avicenna, *The Cure*, section on geometry		Arabic	Anonymous	Spain?[239]
474	before 1400	Albert of Orlamünde, *Summa naturalium* (1)	אותות השמים, ספר השמים והעולם והויים ונפסדים	Latin	Anonymous	Germany[240]
475	ca. 1400	Peter of Spain, *Tractatus* (1)	הגיון	Latin	Abraham Avigdor	Provence[241]
476	ca. 1400	Aristotle, *Nicomachean Ethics*, Latin trans. by Robert Grosseteste, as corrected by William of Moerbeke	ספר המדות לארסטו	Latin	Meir Alguadez	Spain[242]
477	15th cent.	Peter of Spain, *Tractatus* (2)	הגיון	Latin	Anonymous	Italy[243]

[233] See Ferre, "Las traducciones hebreas de la obra médica de Bernard de Gordon"; see also R. W. Emery, "Documents Concerning Some Jewish Scholars in Perpignan in the Fourteenth and Early Fifteenth Century," *Michael* 4 (1976): 27–48, on pp. 43–5.

[234] Ed. A. Eran in her Ph.D. dissertation, "Meqorotaw ha-filosofiyyim šel Avraham Ibn Daʾud be-sifro al-ʿAqida al-rafiʿa," Hebrew University of Jerusalem, 1990.

[235] See Garcia-Ballestrer, Ferre, and Feliu, "Jewish Appreciation," pp. 106–17 (ed. of Hebrew introduction, trans. into English).

[236] See Lévy, "The Establishment," pp. 436–7; see also idem, "L'histoire des nombres amiables," pp. 71–5.

[237] See M. Castells, "Una tabla de posiciones medias planetarias en el *Zij* de ibn Waqar (Toledo, ca. 1357)," in J. Casulleras and J. Samsó, eds., *From Baghdad to Barcelona: Studies in the Islamic Exact Sciences in Honour of Prof. Juan Vernet* (Barcelona, 1996), 1: 445–52.

[238] See T. Lévy, "A Newly-Discovered Partial Hebrew Version of al-Khwārizmī's *Algebra*," *Aleph* 2 (2002): 225–34 n. 1; idem, "L'algèbre arabe dans les textes hébraïques (I)," pp. 286–301. Ed. and trans. into French by I. Wartenberg in her Ph.D. dissertation, "L'épître sur le nombre par Isaac ben Salomon ben al-Aḥdab (Sicile, XIVe siècle)," Université de Paris VII, 2007.

[239] See Lévy, "The Establishment," p. 433.

[240] See Y. T. Langermann, "Another Hebrew Translation of the *Philosophia Pauperum*," *Qiryat Sefer* 64 (1993): 1103–4.

[241] See Manekin, "When the Jews Learned Logic from the Pope," pp. 395–430, esp. 406–22.

[242] Ed. J. M. Satanow, *Aristo, Sefer ha-middot* (Berlin, 1791).

[243] Manekin, ibid., p. 396.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
478	15th cent.?	Pseudo-Aristotle, *Lapidary*	לפידריו	Latin	Anonymous	Italy?
479	15th cent.?	Ptolemy, *The Celestial Sphere (Planisferium)*, Latin trans. by Gerardus Cremonensis	מאמר מורה מופתים / מופתי כלי ההבטה	Latin	Anonymous	Italy?
480	15th cent.?	Martinus de Lucena, *Specific (Medicines)*	סגולות	Latin	Anonymous	?
481	15th cent.?	Arnaldus de Villanova, *Table on Short Life*	מבוא ארנבט	Latin	Gabriel ben Judah of Vitry (?)	Provence (Milhaud)?
482	15th cent.?	Antonius Guainerius of Pavia, *On the Plague*	מאמר בדבר	Latin	Anonymous	Italy?
483	15th cent.?	Johannes Jacobi, *Secret of Medicine* (2)	סוד הפרטיקה	Latin	Anonymous	?
484	15th cent.?	Jean de Saint-Aimand, *Commentary on Nicholas' Prescriptions (Antidotarium)* (1)	הצעה . . . חיברה על ביאור דאנטיטוטי מניקולב	Latin	Anonymous	?
485	15th cent.?	Petrus de Tussignano, *On Plague*	חיבור החכם משטרי פידרו די טושיניינו בקי ברפואה	Latin	Anonymous	Italy?
486	15th cent.?	Tura de Castello of Bologna, *On the Utility of Porretta's Waters*	התועלת ממי פוריטה	Latin	Anonymous	Italy
487	15th cent.?	Anonymous, *On Herbs (in Medicine)*	ספר העשבים וכוחותם	Latin	Ḥayyim Messer Vital	Italy (Romagna)
488	15th cent.?	Anonymous, *(Medical) Substitutes* or *"Quidproquo"*	קויטפרוקו	Latin	Anonymous	?
489	15th cent.?	Hermannus Contractus, *On the Astrolabe* (1)	(ספר האצטרולבין)	Latin	Anonymous	?
490	15th cent.?	Gerardus de Sabbioneta, *Theory of the Planets* (1)	ספר שבעת המשרתים חברו אריסטוטולוס ופרשו בן רשד	Latin	Anonymous	?
491	before 1402	Avicenna, *Canon* (3), book I and treatise 1 of book II	(ספר הקנון)	Arabic	Joseph ha-Lorqi	Spain[244]
492	1403	Jean de Saint-Aimand, *Commentary on Nicholas' Prescriptions (Antidotarium)* (2)	(אנטידוטריום)	Latin	Isaac ben Abraham Cabret	Spain (Barcelona?)

493	1406	Pseudo-Hippocrates, *Astrology* (2)	פנים לפנים	Latin	Tanḥum ben Moses of Beaucaire	Italy (Castel Durante)
494	before 1408	Joseph ha-Lorqi, *Medical Treatise*	גרם המעלות	Arabic	Joseph ben Benveniste Vidal	Spain (Saragossa?)
495	before 1410	Matthaeus Platearius, *On Simple Medicines (Circa instans)* (2)		Latin	Anonymous	Italy?
496	before 1411	Abu Ḥamid al-Ghazali, *Incoherence of the Philosophers*	הפלת הפילוסופים	Arabic	Zeraḥiah ha-Levi Saladin	Spain
497	1412	Boethius, *The Consolation of Philosophy*, Catalan trans. by Pere Saplana and Antoni Ginebreda (1)	מנחם משיב נפשי	Catalan	Samuel Benveniste	Spain (Balaguer in Catalonia)[245]
498	between 1418 and 1510	Balasconus de Taranto (from Portugal), *On Plague*	הנהגת הדבר	Latin or Italian?	Anonymous	Italy?
499	1420	"Petrocellus," *On Cures* (2)	נקיון	Latin	Menaḥem ben Taclet (?) and his son Abraham (three redactions)	?
500	before 1421	Hermannus Contractus, *On the Astrolabe* (2)	ספר אשטרולוג	Latin	Anonymous	?
501	ca. 1420–30	(Pseudo-) Dioscorides, *(Medical) Substitutes*, Latin trans. (?)	תמורת הסמים	Latin	Bonafus Bonfil Astruc	Italy (Marche)
502	1423	Boethius, *The Consolation of Philosophy* (2)	נחמת הפילוסופיא	Latin	Bonafus Bonfil Astruc	Italy (Marche)[246]
503	1429	Abu l-Qasim al-Zahrawi, *Book of Praxis* (5), Latin trans. by Simon de Genoa	משרת הרופאים	Latin	Bonafus Bonfil Astruc	Italy (Senise)

[244] See the list of extant manuscripts in Richler, "Manuscripts of Avicenna's *Kanon*" (under the erroneous name "Joshua Lorqi"); see also Ferre, "Avicena Hebraico"; eadem, "Tras las huellas del *Canon* ebraico."

[245] See Zonta, *La filosofia antica*, pp. 264–5; idem, "Le origini letterarie e filosofiche delle versioni ebraiche del *De consolatione philosophiae* di Boezio," pp. 571–604 in F. Israel, A. M. Rabello, and A. M. Somekh, eds., *Hebraica. Miscellanea di studi in onore di Sergio J. Sierra per il suo 75° compleanno* (Turin, 1998); F. Ziino, "The Catalan Tradition of Boethius's *De consolatione*: A New Hypothesis," *Carmina Philosophiae* 10 (2001): 31–38.

[246] Ed. S. J. Sierra, *Boezio De consolatione philosophiae. Traduzione ebraica di 'Azaria ben r. Joseph Ibn Abba Mari*... (Turin and Jerusalem, 1967). This is really a Hebrew paraphrase of the original work, with the commentary of Nicholas Trevet and Pseudo-Thomas Aquinas: see Zonta, "Le origini letterarie e filosofiche delle versioni ebraiche del *De consolatione philosophiae*."

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
504	before 1434	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *Provisions for the Traveller* (3), Latin trans. by Constantinus Africanus?	צידה לאורחים, 'ביאטיקו'	Arabic or Latin? (or both?)	Abraham ben Isaac	Italy (Rieti or Siena?)
505	ca. 1440?	Pseudo-Aristotle, *Economics*, Latin trans. by Durandus de Alvernia	ספר הנהגת הבית, הנקרא 'איקונומיקש'	Latin	Anonymous (Joseph Ibn Shem Ṭov?)	Spain?[247]
506	1441	William Batecombe, *Oxford Tables*		Latin	Mordekhai Finzi	Italy (Mantua)[248]
507	before 1448	Thomas Aquinas, *Commentary on Aristotle's De anima*	(ביאור ספר הנפש . . . אשר פירש טומאסו מאקינו)	Latin	Anonymous	Italy[249]
508	ca. 1450	Robert Grosseteste, *Summary of Aristotle's Physics*	ספר השמע לליקוניאנשיש	Latin	Anonymous	Spain
509	ca. 1450	Pseudo-Robert Grosseteste, *Book on Soul*	ספר הנפש כפי ליקוניאינשיש	Latin	Anonymous (same as previous text)	Spain[250]
510	ca. 1450	Gerardus de Sabbioneta, *Theory of Planets* (2)	עיון שבעה כוכבי לכת	Latin	Judah ben Samuel Shalom	Italy
511	ca. 1450	Abu Kamil Shuja, *Algebra*		Arabic	Anonymous	Spain[251]
512	ca. 1450	Peter of Spain, *Tractatus* (3)	ההגיון ממשטרו פיאטרו שפאנו	Latin	Judah Shalom	Spain?[252]
513	ca. 1450–60	Abu l-Ḥasan Kushyar, *Arithmetic*	עיון העקרים	Arabic	Shalom ʿAnavi	Turkey (Constantinople)[253]
514	after ca. 1450–60	Saladino di Ascoli (Piceno), *On Drugs*	ספר כולל עניני הרוקחים	Latin	Anonymous	Italy?
515	ca. 1450–1550	Peter of Spain, *Tractatus* (4)	חיבור בפילוסופיה	Latin	Anonymous	Spain or Italy?[254]
516	ca. 1450–1500	Pseudo-Marsilius, *Quaestiones* (on the *Isagoge*, *Categories* and *De interpretatione*)	השאלות והתשובות על מבוא, מאמרות ומליצה לחכם מרשיליו	Latin	Abraham Shalom	Spain[255]
517	ca. 1456	Abu Jaʿfar Aḥmad Ibn al-Jazzar, *Medicine of the Arms* (?)	ספר בן אלג'זר במלאכת הרפואות	Arabic or Latin?	Ḥayyim bar Musa	Spain
518	1458	Judah ben David Ḥayyuj, *Book of Hollow Verbs* (4)	ספר פעלי הכפל	Arabic	Isaac ben Eliezer ha-Levi	Spain?

519	1460	Isaac ben Sid and Judah ben Moses ha-Kohen, *Alphonsine Tables*, Latin trans. by Jean de Murs and Jean de Lignères (1)	לוחות	Latin	Moses of Nîmes	Provence (Avignon)[256]
520	ca. 1462	Pseudo-Thomas Aquinas, *De fallaciis ad quosdam nobiles artistas*	הטעאה	Latin	Anonymous	?
521	1466	Johann von Gmunden, *The Aspect of the Stars*	מראית הכוכבים	Latin	David ben Jacob Qalonymos	Italy
522	1468	Guy de Chauliac, *Short Book of Surgery*	גידוא קצר	Latin	Asher ben Moses Valabregue	Provence (Arles)
523	1468	Taddeo Alderotti, *On Fevers*	כלל קצר על מנהג הקדחות	Latin	Moses ben Immanuel	Italy?
524	before ca. 1470	Averroes, *Long Commentary on Aristotle's De anima*, Latin trans. by Michael Scotus	(ספר הנפש עם פירוש בן רשד הארוך)	Latin	Anonymous (Baruch Ibn Yaʿish?)	Spain or Italy?[257]
525	1470–80	William Ockham, *Summa logicae*, book I, chapters 14–17	הגיון	Latin	Eli Ḥabillo	Spain[258]

[247] See Zonta, *La filosofia antica*, pp. 260–2; idem, "La tradizione ebraica degli scritti economici greci," *Athenaeum* 84 (1996): 549–54.

[248] See Y. T. Langermann, "The Scientific Writings of Mordekhai Finzi," *Italia* 7 (1988): 7–44, on pp. 26–8; repr. in idem, *The Jews and the Sciences in the Middle Ages* (Aldershot 1999), Essay IX.

[249] See Zonta, *La filosofia antica*, p. 233 and nn. 21–2.

[250] Ibid., p. 268.

[251] See M. Levey, *The Algebra of Abû Kâmil, Kitâb fî al-jâbr wa'l-muqâbala, in a Commentary by Mordecai Finzi* (Madison and London, 1966). On the origin of this translation, see the observations by T. Lévy, "L'algèbre arabe dans les textes hébraïques (II). Dans l'Italie des XV^{e} et XVI^{e} siècles, sources arabes et sources vernaculaires," *Arabic Sciences and Philosophy* 17 (2007): 81–107; on translations into modern languages, see ibid., p. 90. See also G. Lacerenza, "A Rediscovered Autograph Manuscript by Mordekay Finzi," *Aleph* 3 (2003): 301–25.

[252] See Manekin, "When the Jews Learned Logic from the Pope," pp. 422–5.

[253] See M. Levey and M. Petruck, *Kushyar Ibn Labban: Principles of Hindu Reckoning* (Madison, 1965).

[254] See Manekin, "When the Jews Learned Logic from the Pope," p. 396.

[255] See C. Manekin, "Scholastic Logic and the Jews," *Bulletin de philosophie médiévale* 41 (1999): 123–47, esp. pp. 132–3.

[256] See J. Chabás and B. R. Goldstein, *The Alfonsine Tables of Toledo* (Dordrecht and Boston, 2003). Moses of Nîmes's translation also includes the Hebrew version of a set of canons for the tables, by John of Saxony. See J. Chabás and B. R. Goldstein, *Astronomy in the Iberian Peninsula: Abraham Zacut and the Transition from Manuscript to Print* (Philadelphia, 2000), p. 22.

[257] See M. Zonta, "Osservazioni sulla tradizione ebraica del *Commento grande* di Averroè al *De anima* di Aristotele," *Annali di Ca' Foscari* 33 s.or. 25 (1994): 15–28; see also idem, *Hebrew Scholasticism in the Fifteenth Century: A History and Source Book* (Dordrecht, 2006), pp. 113–4.

[258] See G. Tamani and M. Zonta, *Aristoteles Hebraicus. Versioni, commenti, e compendi del* Corpus Aristotelicum *nei manoscritti ebraici delle biblioteche italiane* (Venice, 1997), pp. 139–40.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
526	1471 (or 1477)	Pseudo-Aristotle, *Book of the Pure Good (Liber de causis)*, Latin trans. by Gerardus Cremonensis (4)	ספר הסבות	Latin	Eli Ḥabillo	Spain[259]
527	1471–2?	Pseudo-Thomas Aquinas, *On Soul's Powers (De potentiis animae)* (abridged)	מאמר בכוחות הנפש לחכם טומאש די אקינו	Latin	Eli Ḥabillo (?)	Spain[260]
528	1471–2?	Thomas Aquinas, *Disputed Questions on Soul*	שאלות בנפש	Latin	Eli Ḥabillo	Spain[261]
529	1471–2?	Thomas Aquinas, *On Being and Essence* (2)	מאמר ענין הנמצא והמהות	Latin	Eli Ḥabillo	Spain
530	1471–2?	Pseudo-Thomas Aquinas, *On Universals* (inc. *Circa universalia*)	בענין הכולל	Latin	Eli Ḥabillo	Spain
531	1472	Jean Letourneur (Johannes Versor), *Questions on Aristotle's Physics*	ספר השמע הטבעי	Latin	Eli Ḥabillo	Spain (Monzón in Aragon)[262]
532	1472	Jean Letourneur (Johannes Versor), *Questions on Aristotle's De generatione*	ספר ההויה וההפסד	Latin	Eli Ḥabillo	Spain (Monzón in Aragon)
533	1472	Jean Letourneur (Johannes Versor), *Questions on Aristotle's De anima*	ספר הנפש	Latin	Eli Ḥabillo	Spain (Monzón in Aragon)
534	ca. 1472?	Isaac ben Sid and Judah ben Moses ha-Kohen, *Alphonsine Tables*, Latin trans. by Jean de Murs and Jean de Lignères (2)	לוחות	Latin	Anonymous	Spain (Salamanca?)[263]
535	1473	Saadia ben Maimon Ibn Danan, *What Is Necessary in (the Grammar of) the Hebrew Language*	הכלל ההכרחי בדקדוק הלשון העברית	Arabic	Saadia ben Maimon Ibn Danan (the author himself)	Spain (Granada)[264]

536	1473	Jean Letourneur (Johannes Versor), *Questions on Aristotle's Parva Naturalia*	ספר חוש ומוחש, ספר זכירה והזכרות, ספר שינה ויקיצה, ספר אורך החיים וקיצורם	Latin	Eli Ḥabillo	Spain (Monzón in Aragon)
537	1473	Jean Letourneur (Johannes Versor), *Questions on Aristotle's De caelo*	ספר השמים והעולם	Latin	Eli Ḥabillo	Spain (Monzón in Aragon)
538	1473?	Jean Letourneur (Johannes Versor), *Questions on Thomas Aquinas' On Being and Essence*	שאלות מאמר בנמצא ובמהות	Latin	Eli Ḥabillo	Spain[265]
539	ca. 1473?	Bartolomeo Manfredi Dell'Orologio, *Description of the "Celidario"*	המאמר בכלי שמימיי הנקרא צילידאריאו	Latin?	Anonymous (Mordekhai Finzi?)	Italy[266]
540	ca. 1473?	Giovanni Bianchini, *Astronomical Tables*	לוחות	Latin	Anonymous (Mordekhai Finzi?): two translations (one with the tables and another with ten chapters of the work)	Italy
541	ca. 1473?	Anonymous, *Book of Geometry*	ספר המדידה	Latin	Anonymous (Mordekhai Finzi?)	Italy

[259] See Rothschild, "Les traductions du *Livre des causes*."

[260] Ed. in A. Jellinek, *Philosophie und Kabbala* II (Leipzig, 1854), pp. 26–31. For a new critical edition, including a comparison with the Latin original version (an abridgement of Pseudo-Aquinas's *De potentiis animae*), see J.-P. Rothschild, "The Hebrew Translation of Ps.-Thomas Aquinas *De potentiis animae* in the Circle of the Ibn Šem Ṭovs (Spain, ca. 1450–1475)," pp. 89–131 in G. Busi, ed., *Hebrew to Latin – Latin to Hebrew: The Mirroring of Two Cultures in the Age of Humanism* (Berlin and Turin, 2006), on pp. 108–29.

[261] Ed. of questions 6 and 7 by A. Jellinek, *Die VI. und VII. Frage aus den "Quaestiones disputatae de anima" von Thomas von Aquino* (n.p., n.d.).

[262] For a partial English translation of the introduction see Zonta, *Hebrew Scholasticism in the Fifteenth Century*, pp. 199–201.

[263] See Chabás and Goldstein, *Astronomy in the Iberian Peninsula*, pp. 22–3.

[264] Ed. M. Cohen, *Ha-haqdamot ha-diqduqiyyot le-Sefer ha-šorašim le-R. Saʿadyah ben Maimon Ibn Danan* (Jerusalem, 2000); C. Del Valle Rodriguez, *Historia de la Gramática Hebrea en España. Volumen X: La gramática hebrea de Ibn Danán en la versión árabe y hebrea* (Madrid, 2004).

[265] See Zonta, "The Autumn of Medieval Jewish Philosophy," p. 490 and n. 94.

[266] See B. R. Goldstein, "Descriptions of Astronomical Instruments in Hebrew," in D. A. King and G. Saliba, eds., *Essays in Honor of E. S. Kennedy, Annals of the New York Academy of Sciences* 500 (1987): 105–41, on pp. 120–1. For the translations ascribed to Mordekhai Finzi in general, see also Langermann, "The Scientific Writings by Mordekhai Finzi."

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
542	ca. 1473?	Gerardus de Sabbioneta, *Theory of Planets* (3)		Latin	Anonymous (Mordekhai Finzi)?	Italy
543	1473–5	Maestro Dardi of Pisa, *Treatise of Algebra*	(קצור אלג'בר אמוגאבאלא)	Italian	Mordekhai Finzi	Italy (Mantua)[267]
544	ca. 1473–5	Aristotle, *Physics*, Latin trans. by William of Moerbeke, books I–IV	פירוש על ד' מאמרים מן השמע הטבעי	Latin	Judah Messer Leon	Italy (Mantua)[268]
545	1473–86?	Antonius Guainerius of Pavia, *On Fevers* (1)	כלל בהקדחות	Latin	Solomon ben Moses Shalom	Italy?
546	1473–86?	Bartolomeo Montagnana, *Medical Advices*	העצה	Latin	Solomon ben Moses Shalom	Italy?
547	after 1473?	Antoni Andreu, *Questions on Aristotle's Metaphysics*	שאלות על ספר מה שאחר הטבע להחכם אנטוני אנדריב	Latin	Eli Ḥabillo	Spain[269]
548	after 1473?	Jean Letourneur (Johannes Versor), *Questions on Aristotle's Nicomachean Ethics*	ספר המדות	Latin	Eli Ḥabillo	Spain
549	after 1473?	Vicent Ferrer, *Question on the Unity of the Universal*	מאמר נכבד בכולל	Latin	Eli Ḥabillo	Spain[270]
550	1474	Raimundus Lullus, *Short Art*	מלאכה קצרה / רימונדינאש	Latin	Anonymous (Pinḥas Ṣevi ben Natana'el Mozon or Guglielmo Raimondo Moncada?)	Italy (Senigallia)[271]
551	before 1475	Johannes de Janduno, *Questions on Aristotle's De anima*		Latin	Anonymous (Barukh Ibn Yaʿish ?)	Italy or Spain?[272]
552	ca. 1480–1505	Pseudo-Albertus Magnus, *Questions*	שאלות ותשובות	Latin	Moses Ibn Ḥabib	Italy[273]
553	ca. 1480	Aristotle, *Nicomachean Ethics*, Latin trans. by Leonardo Bruni and Ioannes Argyropulos	ספר המדות	Latin	Barukh Ibn Yaʿish	Spain[274]

554	ca. 1480	Pseudo-Aristotle, *Economics*, books I and III, Latin trans. by Leonardo Bruni	(ספר הנהגת הבית)	Latin	Barukh Ibn Yaʿish?	Italy or Spain?[275]
555	1483	Antonius Guainerius of Pavia, *On Fevers* (2)	(בהקדחות?)	Latin	Anonymous (son of Gedaliah?)	Italy?
556	ca. 1485	Aristotle, *Metaphysics*, books I–XII, Latin trans. by William of Moerbeke	ספר מה שאחר הטבע לארסטו	Latin	Barukh Ibn Yaʿish	Spain
557	1490	Thomas Aquinas, *Commentary on Aristotle's Metaphysics*	(ביאור ספר מה שאחר הטבע לטומאס מאקינו?)	Latin	Abraham Ibn Naḥmias	Spain (Ocaña)[276]
558	before 1492	Albert of Orlamünde, *Summa naturalium* (2)	אוצר העניים / קיצור הפילוסופיא הטבעית	Latin	Abraham Shalom	Spain
559	before 1492?	Thomas Aquinas, *Disputed Question on Spiritual Creatures*		Latin	Anonymous (quoted by Moses Almosnino, 16th-cent. Greece)	Spain?
560	shortly after 1492	Thomas Bricot, *Short Treatise on Natural Philosophy*	תולדות אדם	Latin	David Ibn Shoshan (from Spain)	Provence (Avignon)
561	1491–2	Avicenna, *Canon* (4)	הקאנון	Arabic (?)	Anonymous	Italy (Naples)[277]

[267] See W. Van Egmond, "The Algebra of Master Dardi of Pisa," *Historia Mathematica* 10 (1983): 399–421; on the Hebrew version, see esp. Lévy, "L'algèbre arabe dans les textes hébraïques (II)."

[268] See Zonta, *Hebrew Scholasticism in the Fifteenth Century*, pp. 214–17, 239, and 41* (Hebrew section). See also idem, "The Knowledge of Latin Philosophical Literature among Jewish Philosophers in 15th Century Italy: Scholastic Sources in Yehudah Messer Leon's Commentary on Aristotle's *Physics*," in Busi, *Hebrew to Latin*, pp. 133–66. Only books I–III of the work survive in the five extant manuscripts.

[269] See Zonta, "The Autumn of Medieval Jewish Philosophy," p. 486 and n. 67. See also the edition and English paraphrase of the introduction in idem, *Hebrew Scholasticism in the Fifteenth Century*, pp. 178–99 and 11*–24* (Hebrew section).

[270] See M. Zonta, "The Original Text of Vincent Ferrer's *Tractatus de unitate universalis* discovered in an Unknown Hebrew Translation?" *Bulletin de philosophie médiévale* 39 (1997): 147–51; a critical edition by M. Zonta, accompanied by a Latin version and an English translation, is found in Vicent Ferrer, *Quaestio de unitate universalis*, מאמר נכבד בכולל *(Ma'amar nikhbad ba-kolel)*, eds. A. Fidora and M. Zonta (Santa Coloma de Queralt, 2010), on pp. 172–357.

[271] On this work and its possible authorship, see H. J. Hames, "Jewish Magic with a Christian Text: A Hebrew Translation of Ramon Llull's *Ars Brevis*," *Traditio* 54 (1999): 283–300. A critical edition, by H. Hames, is in progress.

[272] See M. Zonta, "Un'ignota versione ebraica delle *Quaestiones in De anima* di Jean de Jandun e il suo traduttore," *Annali di Ca' Foscari* 32 s.or. 24 (1993): 5–34. See also idem, *Hebrew Scholasticism in the Fifteenth Century*, pp. 113–14.

[273] See Zonta, *Hebrew Scholasticism in the Fifteenth Century*, p. 28 n. 120.

[274] See Zonta, *La filosofia antica*, pp. 273–4; idem, "La tradizione ebraica degli scritti economici greci," pp. 553–4.

[275] See Zonta, *La filosofia antica*, p. 274; idem, "La tradizione ebraica degli scritti economici greci," p. 554.

[276] The text of this translation is preserved in a single manuscript, recently sold by the former Jews' College, London; only Ibn Naḥmias's introduction was published by S. Sachs, in *Kerem ḥemed* 8 (1854): 110–11. See Zonta, *La filosofia antica*, pp. 156–7.

[277] This print edition of the work is only partially based on the Hebrew translations by Natan ha-Me'ati and ha-Lorqi, but may involve direct consultation of the Arabic text.

	Date (often approximate or hypothetical)	Author and Title (sometimes the author of the version employed by the Hebrew translator)	Title of the Hebrew Translation (if known)	Language of Translated Text	Hebrew Translator	Country
562	1494 or before	Abu Ḥamid al-Ghazali, *The Balance of Knowledge*		Arabic	Anonymous (Guglielmo Raimondo Moncada?)	?[278]
563	1498	Abu Bakr al-Khasibi (Albubather), *Book on Nativities*, Latin trans.	ספר המולדות לאלבובאטיר	Latin	Isaac Abu l-Khayr (from Spain)	?
564	ca. 1498?	Ibn Abi l-Rijal, *Complete (Astronomical) Treatise*, Latin trans. by Egidio de' Tebaldi (2)	ספר לעלי בן ראג'יל	Latin	Isaac Abu l-Khayr (from Spain)	?
565	end of 15th cent.	Ulugh Begh, *Astronomical Tables*	לוחות	Persian (Tajik?)	Anonymous	Italy (Venice) or Turkey (Constantinople)[279]
566	end of 15th cent.	Luca Pacioli, *Summa de aritmetica, geometria, proportioni e proportionalità*	ליקוטים	Italian	Anonymous	Italy
567	end of 15th cent.?	Anonymous, *Treatise on the Eclipses*	מאמר נכבד בלקיות שמשיות וירחיות	Latin or Spanish?	Moses Sahlun of Ciudad	Turkey (Constantinople)?
568	end of 15th cent.?	Aḥmad Ibn Aḥmad al-Sanbati, *On Astronomical Quadrants* and *On the Construction of Astronomical Tables*	פירוש הרובע הקשתותי	Arabic	Moses Galliano	Greece
569	end of 15th cent.?	Anonymous, *Judgments of the Aspects (of Stars)*	משפטי המבטים	Arabic	Moses Galliano	Greece
570	end of 15th cent.?	ʿUmr Ibn Muḥammad, *Astronomical Compendium*	ספר מזוקק	Arabic	Moses ben Elijah (Galliano)	Greece
571	1501	Anonymous, *Book of Medicines and (Medical) Qualities*	ספר רפואות וסגולות	Latin	Anonymous	Italy (Brescia)

[278] See Zonta, "Fonti antiche e medievali della logica ebraica nella Provenza del Trecento," pp. 566–7n. This translation was surely made by 1494, since a copy seems to have been part of the library of Pico della Mirandola (d. 1494); Guglielmo Raimondo Moncada, Pico's "official" Hebrew-to-Latin translator, may have worked on it.

[279] See Goldstein, "The Survival of Arabic Astronomy in Hebrew," pp. 37–9.

POSTSCRIPTUM

In the colloquium "Latin into Hebrew: The Transfer of Philosophical, Scientific and Medical Lore from Christian to Jewish Cultures in Southern Europe (12th–15th Centuries)," in Paris, C. N. R. S., December 7th to 9th, 2009, some new information concerning translations in the table was discussed:

1. Entry no. 354: Carsten Wilke (Central European University, Budapest) pointed out that together with Albert the Great's *On Spirit and Breathing*, the Italian fourteenth-century Jewish philosopher Judah Romano also translated into Hebrew the complete text of another short Latin work by Albert the Great, namely, the treatise *On Form as It Appears in a Mirror* (*De forma resultante in speculo*).
2. Entry no. 442: Naama Cohen-Hanegbi (Hebrew University of Jerusalem) pointed out that the first Latin-into-Hebrew translation of Bernardus de Gordon's *Lily of Medicine* was made by Moses ben Samuel of Roquemaure in Seville in 1360, after he already had converted to Christianity under the name of "Jean de Aviñon."
3. Entry no. 474: Resianne Fontaine (University of Amsterdam) pointed out that the first Latin-into-Hebrew translation of Albert of Orlamünde's *Summa naturalium*, which, according to her, was made in a still unknown place and date, includes an indirect translation of Albert the Great's *Meteora*, book 3, treatise 3, chapters 19–22.

3

Arabic and Latin Cultures as Resources for the Hebrew Translation Movement

Comparative Considerations, Both Quantitative and Qualitative

Gad Freudenthal

> Die Geschichte der jüdischen Philosophie ist eine Geschichte von Rezeptionen fremden Gedankenguts.
>
> – Julius Guttmann (1933)[1]

Most of the scientific and philosophical activity of medieval Jews was in the Greco-Arabic tradition. Jewish scholars in the Islamic world had direct access to the texts of this tradition. By contrast, their co-religionists in Christian Europe, whose cultural language was Hebrew, almost exclusively depended on texts in that language – either translations of works from other languages or works composed in Hebrew by scholars on the basis of their reading in other languages. This dependence on translations of scientific and philosophical works from Arabic or from Latin (only very rarely from vernaculars) distinguishes the Jewish acquisition of science and philosophy in Christian Europe from its earlier phase in the East, when Arabophone Jews absorbed non-Jewish learning directly from the majority culture.

The present essay probes the dissimilar attitudes of medieval Judaism toward the two resource cultures on which it drew. Contrary to the case in the Muslim-Arabic setting, in Christian-Latin contexts, Jews took over very little science and philosophy from their immediate environment and did so slowly and hesitatingly (although this varied as a function of the era, discipline, and venue). It is particularly intriguing that the learned Jewish circles in Provence (as medieval Jews referred to the Midi) and (although less so) in Italy, whose cultural tongue was Hebrew and who, beginning in the mid-twelfth century, absorbed "external knowledge" in Hebrew, preferred to rely on Arabic sources imported from the Iberian peninsula rather than turn to the Latin writings of their neighbors. Only in medicine was there a significant absorption of Latin learning into Hebrew. The discomfort with Latin culture did not lessen until the late fourteenth century and only the fifteenth century witnessed the rise in northern Spain of what Mauro Zonta has fittingly dubbed "Hebrew Scholasticism."[2]

[1] Julius Guttmann, *Die Philosophie des Judentums* (Munich: Verlag Ernst Reinhardt, 1933), p. 9.

[2] Mauro Zonta, *Hebrew Scholasticism in the Fifteenth Century: A History and Source Book* (Dordrecht: Springer, 2006).

For helpful advice on topics discussed here, I am very grateful to Cyril Aslanov, Ram Ben-Shalom, Ofer Elior, Resianne Fontaine, Bernard R. Goldstein, Zeev Gries, Eleazar Gutwirth, Maurice Kriegel, Micha J. Perry, Judith Olszowy-Schlanger, Carsten Wilke, and Mauro Zonta. Ruth Glasner's insightful observations were particularly consequential. An early version of this essay appeared as "'Arav and 'Edom as Cultural Resources of Medieval Judaism: Different Attitudes toward Arabic and Latin Learning in the Midi and in Italy," in Maria Esperanza Alfonso Carro and Carmen Caballero, eds., *Late Medieval Jewish Identities* (New York: Palgrave Macmillan, 2010), pp. 123–56. The present publication corrects and supersedes it on many points.

In what follows, I try to describe this cluster of related phenomena and shed some light on them.

A preliminary reminder is in order. From the point of view of traditional Jewish culture, science and philosophy are, by definition, alien bodies of knowledge. The hard core of Jewish culture, the common kernel shared by all Jewish milieus, consists of the canonical Jewish texts, notably the Talmud and related literature: All other bodies of knowledge are referred to in Jewish discourse as *ḥoḵmot ḥiṣoniyyot* ("external" or "foreign" sciences) or *ḥoḵmah yewanit* (Greek science). The attitudes toward these alien bodies of knowledge and their legitimacy varied; some Jews held them to be indispensable to Judaism, whereas others totally rejected them as undermining the Torah.[3] The latter, the "traditionalists" who rejected any attempt to incorporate foreign learning, will not concern us here; their negative attitude to non-Jewish bodies of knowledge, whether in Arabic or in Latin, was constant. I limit myself to that segment of medieval Judaism that *was* interested in so-called foreign wisdom and ask why, for this sector, the reception from Arabic sources was so much smoother and more extensive than that from Latin. My concern will be almost exclusively with philosophical and scientific (including medical) knowledge; the attitude toward other genres, such as historical literature and belles lettres, was usually different and will not detain us here.[4]

THE APPROPRIATION OF SCIENCE, PHILOSOPHY, AND MEDICINE FROM ARABIC AND FROM LATIN CULTURES: A COMPARATIVE VIEW

Translations of Science and Philosophy from Arabic and from Latin: Quantitative Comparison

I begin with some quantitative data on the differences in the borrowings from Arabic and Latin, to provide some factual information about the intellectual preferences of Jewish scholars in the twelfth to fifteenth centuries. In the following paragraphs, I will show that the overwhelming majority of Jewish philosophical writers were consistently more interested in Arabic than in Latin culture. I suggest that we are dealing with a *longue-durée*, deep-seated cultural attitude, and I try to identify some of its causes. Physicians, in contrast to the philosophical writers, evince a different cultural attitude and increasingly assimilate Latin medical knowledge.

Consider the following data on the ratio of the translations of science and philosophy from Arabic and from Latin. A very rough estimate can be gleaned from Steinschneider's monumental *Die hebräischen Übersetzungen*: Of its 970 pages, only 145 (15 percent) are devoted to translations of works by Christians, with about half of them medical texts.[5] This preliminary impression can be refined considerably. A chronological list of the principal philosophical,

[3] For a historical overview and bibliography, see Jacob J. Schacter, ed., *Judaism's Encounter with Other Cultures: Rejection or Integration?* (Northvale, NJ and Jerusalem: Jason Aronson, 1997).

[4] See, e.g., *The Josippon* [Josephus Gorionides], ed. David Flusser (Jerusalem: Mosad Bialik, 1980–1), Vol. 2, p. 108. *Josippon* was adapted from Latin in 953. Flusser remarks that historical literature was perceived as "harmless" even by the conservative circles that shunned other, more rationalistic, "foreign" literary genres. He cites S. J. Agnon's description of a traditional Jew reading *Josippon* and *Mišlei šuʿalim* on Shabbat (ibid., p. 174).

[5] In Moritz Steinschneider, *Die Hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893; repr. Graz, 1956; in the sequel: *HÜ*), the translations from Latin of works that were themselves translations from Arabic are discussed under the author's name in the section "Arabs." Steinschneider's category of translations of works by Christian authors (the fourth chapter in each of the four parts of *HÜ*) is therefore far from including all translations made from Latin. He notes (*HÜ*, p. XXII) that the number of Christian authors translated into Hebrew (around a hundred) is greater than the number of Muslim authors translated (seventy or so). He qualified this fact as "surprising," obviously on the basis of his intuition that medieval Hebrew intellectual life developed essentially in the wake of Arabic culture. The intuition is not at variance with the facts: What matters is the number of works translated and their impact, not the number of authors. Moreover, many of the works translated from Latin remained virtually without any influence (also see n. 10, this chapter).

TABLE 3.1. *Hebrew Translations before 1200, by Subject and Source Language*

Translated from Arabic		Translated from Latin	
Philosophy and Science	Medicine	Philosophy and Science	Medicine
N = 28 % of TOTAL: 97	N = 1 % of TOTAL: 3	N = 0 % of TOTAL: 0	N = 18 Provence 17 Unknown: 1 % of TOTAL: 100
N = 29 % of TOTAL: 62		N = 18 % of TOTAL: 38	
TOTAL: N = 47			

Note: For philosophy and science, $n = 28$ (60% of all translations), all translated from Arabic. For medicine, $n = 19$ (40% of all translations), with 1 translated from Arabic (5% of translations in this area) and 18 translated from Latin (95% of translations in this area).

scientific, and medical works translated into Hebrew before 1500, compiled by Mauro Zonta, is included elsewhere in this volume.[6] Drawing on this list of 571 titles, I have prepared four tables. They summarize by each half century and century the distribution of translations by discipline and source language.[7] Table 3.1 shows Hebrew translations before 1200.

We see that of the forty-seven works translated during the twelfth century (most of them in its second half), twenty-nine (62 percent) were translated from Arabic, and only eighteen (38 percent) were translated from Latin. If we consider only works of science and philosophy, Arabic is the only source language. Correspondingly, all the works translated from Latin are on the topic of medicine. Of these eighteen translations, seventeen are the work of a single translator (an anonymous repentant convert, active in the Midi between 1197 and 1199, who referred to himself as "Doʾeg ha-ʾEdomi"; I give more information on him later). Were it not for this particular translator, there would have been virtually no Latin-to-Hebrew translations in the twelfth century. Clearly, the infant Hebrew science and philosophy were linked by their umbilical cords to Arabic culture.

It is not surprising that many more Hebrew translations were produced during the thirteenth century than during the twelfth century. (As noted, translation activity began in earnest only in the second half of the twelfth century, but the disparity remains even when prorated.) This growth tendency is also clear if we compare the first half of the thirteenth century (62 datable translations) with the second half (110 datable translations), as shown in Table 3.2. The number of translations from Arabic (161, or 85 percent) dwarfs that of translations from Latin (29, or 15 percent). It is noteworthy that in the thirteenth century, the ratios of translations from Arabic to translations from Latin are not all that different between science and philosophy (91 percent vs. 9 percent) and medicine (73 percent vs. 27 percent). This confirms that Hebrew science and philosophy and Hebrew medicine continued to depend heavily on Arabic culture during the thirteenth century.

In the fourteenth century, the total number of Hebrew translations increased by 43 in comparison with the thirteenth century, passing from 190 to 233 (an increase of 23 percent). The increase is concentrated in medicine, as we can see in Table 3.3. Whereas the number of translations in science and philosophy is almost constant (128 and 134, respectively),

6 See Mauro Zonta, "Medieval Hebrew Translations of Philosophical and Scientific Texts: A Chronological Table," Chapter 2 in this volume.

7 Zonta's table indicates the known or presumed geographical area in which each translation was made. Many of these indications are not certain, and Zonta employed a question mark. I nonetheless used these indications, assuming that the errors roughly cancel out. Of the 571 items in the table, only 13 works were not taken into consideration, either because the source language was other than Arabic or Latin or because the source language is unknown (works 270, 271, 288, 290, 293, 297, 454, 497, 517, 543, and 565–7).

TABLE 3.2. *Hebrew Translations 1201–1300, by Subject and Source Language*

<table>
<tr><th></th><th colspan="2">Translated from Arabic</th><th colspan="2">Translated from Latin</th></tr>
<tr><th></th><th>Philosophy and Science</th><th>Medicine</th><th>Philosophy and Science</th><th>Medicine</th></tr>
<tr><td rowspan="3">1201–50</td><td>N = 57
% of TOTAL: 95</td><td>N = 3
% of TOTAL: 5</td><td>N = 2
% of TOTAL: n.s.</td><td>N = 0
% of TOTAL: n.s.</td></tr>
<tr><td colspan="2">N = 60
% of TOTAL: 97</td><td colspan="2">N= 2
% of TOTAL: 3</td></tr>
<tr><td colspan="4">TOTAL: N = 62</td></tr>
<tr><td rowspan="3">1251–1300</td><td>N = 50
% of TOTAL: 59</td><td>N = 35
% of TOTAL: 41</td><td>N = 10
Spain: 2
Provence: 2
Italy: 5
North: 1
% of TOTAL: 40</td><td>N = 15
Spain: 1
Provence: 7
Italy: 7
% of TOTAL: 60</td></tr>
<tr><td colspan="2">N = 85
% of TOTAL: 77</td><td colspan="2">N = 25
% of TOTAL: 23</td></tr>
<tr><td colspan="4">TOTAL: N = 110</td></tr>
<tr><td rowspan="3">Other 13th-cent. translations[a]</td><td>N = 9
% of TOTAL: 56</td><td>N = 7
% of TOTAL: 44</td><td>N = 0
% of TOTAL: n.s.</td><td>N = 2
Provence: 1
Unknown: 1
% of TOTAL: n.s.</td></tr>
<tr><td colspan="2">N = 16
% of TOTAL: 89</td><td colspan="2">N = 2
% of TOTAL: 11</td></tr>
<tr><td colspan="4">TOTAL: N = 18</td></tr>
<tr><td rowspan="3">Entire 13th cent.</td><td>N = 116
% of TOTAL: 72</td><td>N = 45
% of TOTAL: 28</td><td>N = 12
Spain: 4
Provence: 2
Italy: 5
Northern France: 1
% of TOTAL: 41</td><td>N = 17
Spain: 1
Provence: 8
Italy: 7
Unknown: 1
% of TOTAL: 59</td></tr>
<tr><td colspan="2">N = 161
% of TOTAL: 85</td><td colspan="2">N = 29
% of TOTAL: 15</td></tr>
<tr><td colspan="4">TOTAL: N = 190</td></tr>
</table>

Note: For philosophy and science, $n = 128$ (67% of all translations), with 116 translated from Arabic (91% of all translations in this area) and 12 translated from Latin (9% of translations in this area). For medicine, $n = 62$ (33% of all translations), with 45 translated from Arabic (73% of translations in this area) and 17 translated from Latin (27% of translations in this area). n.s. = not significant.

[a] That is, translations for which more precise dating is impossible.

TABLE 3.3. *Hebrew Translations, 1301–1400, by Subject and Source Language*

<table>
<tr><th rowspan="2"></th><th colspan="2">Translated from Arabic</th><th colspan="2">Translated from Latin</th></tr>
<tr><th>Philosophy and Science</th><th>Medicine</th><th>Philosophy and Science</th><th>Medicine</th></tr>
<tr><td rowspan="3">1301–50</td><td>N = 70
% of TOTAL: 89</td><td>N = 9
% of TOTAL: 11</td><td>N = 24
Italy: 23
Provence: 1
% of TOTAL: 73</td><td>N = 9
Spain: 3
Provence: 4
Italy: 1
Unknown: 1
% of TOTAL: 27</td></tr>
<tr><td colspan="2">N = 79
% of TOTAL: 71</td><td colspan="2">N = 33
% of TOTAL: 29</td></tr>
<tr><td colspan="4">TOTAL: N = 112</td></tr>
<tr><td rowspan="3">1351–1400</td><td>N = 11
% of TOTAL: 79</td><td>N = 3
% of TOTAL: 21</td><td>N = 8
Spain: 2
Provence: 5
North: 1
% of TOTAL: 27</td><td>N = 22
Provence: 14
Spain: 1
Italy: 3
Unknown: 4
% of TOTAL: 73</td></tr>
<tr><td colspan="2">N = 14
% of TOTAL: 32</td><td colspan="2">N = 30
% of TOTAL: 68</td></tr>
<tr><td colspan="4">TOTAL: N = 44</td></tr>
<tr><td rowspan="3">Other 14th-cent. translations[a]</td><td>N = 19
% of TOTAL: 43</td><td>N = 25
% of TOTAL: 57</td><td>N = 2
Unknown: 2
% of TOTAL: 6</td><td>N = 31
Provence: 2
Italy: 4
Unknown: 25
% of TOTAL: 94</td></tr>
<tr><td colspan="2">N = 44
% of TOTAL: 57</td><td colspan="2">N = 33
% of TOTAL: 43</td></tr>
<tr><td colspan="4">TOTAL: N = 77</td></tr>
<tr><td rowspan="3">Entire 14th cent.</td><td>N = 100
% of TOTAL: 73</td><td>N = 37
% of TOTAL: 27</td><td>N = 34
Spain: 2
Provence: 6
Italy: 23
Germany: 1
Unknown: 2
% of TOTAL: 35</td><td>N = 62
Spain: 4
Provence: 20
Italy: 8
Unknown: 30
% of TOTAL: 65</td></tr>
<tr><td colspan="2">N = 137
% of TOTAL: 59</td><td colspan="2">N = 96
% of TOTAL: 41</td></tr>
<tr><td colspan="4">TOTAL: N = 233</td></tr>
</table>

Note: For philosophy and science, $n = 134$ (58% of all translations), with 100 translated from Arabic (75% of all translations in this area) and 34 translated from Latin (25% of translations in this area). For medicine, $n = 99$ (42% of all translations), with 37 translated from Arabic (37% of translations in this area) and 62 translated from Latin (63% of translations in this area). n.s. = not significant.

[a] That is, translations for which more precise dating is impossible.

translations of medical works increase significantly, from 62 to 99 (60 percent). The share of translations from Arabic (59 percent) remains higher than that of translations from Latin (41 percent), but this share is not as lopsided as it was in the previous century (when the figures were 85 percent and 15 percent, respectively). The picture becomes more interesting if we consider science and philosophy on the one hand and medicine on the other. In the former, the share of translations from Arabic (75 percent) is still much higher than that of translations from Latin (25 percent), though less so than in the previous century (91 percent and 9 percent, respectively). In fact, the shift toward Latin took place mainly in medicine. Whereas in the thirteenth century, medical translations from Arabic were preponderant (73 percent, vs. 27 percent of translations from Latin), in the fourteenth century the proportions are reversed: 63 percent are Latin-to-Hebrew and 37 percent are Arabic-to-Hebrew medical translations. The picture can be refined further if we note that this shift in the relative shares of the two languages is entirely due to an increase in the total number of translations: The total number of translations from Arabic in all disciplines decreased somewhat (from 161 in the thirteenth century to 137 in the fourteenth), with a corresponding rise in translations from Latin (from 29 to 96). What increased most was medical translations from Latin (from 17 to 62), accompanied by a parallel increase in translations from Latin in science and philosophy (from 12 to 34). This sharp rise in medical translations from Latin reflects the Jews' increasing involvement in modern ("bookish") Galenic medicine. If, in the thirteenth century, Jewish medical theory drew mainly on Arabic works, in the fourteenth century, the continued development of Jewish medicine created a strong demand for translations from Latin. We indeed have abundant qualitative evidence that Jewish physicians were under pressure to assimilate cutting-edge Latin medicine.[8]

A point that deserves particular attention is the geographical distribution of translations. Of the thirty-four translations from Latin of scientific and philosophical works during the fourteenth century, no fewer than twenty-three (68 percent) were written in Italy. This phenomenon was already visible in the thirteenth century but was less significant because the numbers were smaller (five out of twelve translations). I discuss this phenomenon in some detail later. (The corresponding figures for medical translations are insignificant because the geographical origin of half of them is unknown.)

As we can see in Table 3.4, the total number of translations sharply decreased in the fifteenth century (there were only 89, which is 62 percent fewer than the 233 of the fourteenth century). This is due not only to historical circumstances (mainly persecutions) but also to cultural developments: In the fifteenth century, there were almost no translations from Arabic – 9 in science and philosophy and 3 in medicine, as against 100 and 37, respectively, in the previous century. By contrast, translations from Latin decreased only slightly (to 77, from 96 in the fourteenth century). The decline in translations from Arabic reflects the loosening ties to Arabic civilization, the decreasing availability of translators, and the fact that there already were Hebrew versions of the Arabic works of most interest to Jewish scholars. The slight overall decrease in the total number of translations from Latin conceals a more interesting reality. Whereas medical translations from Latin plummeted from sixty-two in the fourteenth century to twenty-four in the fifteenth, the number of philosophical and scientific works rose steeply, from thirty-four in the fourteenth century to fifty-three in the fifteenth. This dramatic and surprising increase in the number of scientific-philosophical translations from Latin in what was otherwise a period of decline for the translation movement is a remarkable phenomenon: It is the quantitative aspect of the phenomenon that Zonta identified on the qualitative level and dubbed "Hebrew Scholasticism."

[8] Luis García-Ballester, Lola Ferre, and Eduard Feliu, "Jewish Appreciation of Fourteenth-Century Scholastic Medicine," *Osiris*, 2nd series, 6 (1990): 85–117; repr. in Luis García-Ballester, *Medicine in a Multicultural Society: Christian, Jewish and Muslim Practitioners in the Spanish Kingdoms, 1222–1610* (Aldershot: Ashgate, 2001; Variorum Collected Series, No. 702), Essay IV.

TABLE 3.4. *Hebrew Translations, 1401–1500, by Subject and Source Language*

	Translated from Arabic		Translated from Latin	
	Philosophy and Science	Medicine	Philosophy and Science	Medicine
1401–50	N = 2 % of TOTAL: n.s.	N = 2 % of TOTAL: n.s.	N = 9 Spain: 4 Italy: 4 Unknown: 1 % of TOTAL: 56	N = 7 Spain: 1 Italy: 5 Unknown: 1 % of TOTAL: 44
	N = 4 % of TOTAL: 20		N = 16 % of TOTAL: 80	
	TOTAL: N = 20			
1451–500	N = 7 % of TOTAL: 87	N = 1 % of TOTAL: 13	N = 39 Spain: 23 Provence: 2 Italy: 9 Unknown: 5 % of TOTAL: 85	N = 7 Provence: 1 Italy: 6 % of TOTAL: 15
	N = 8 % of TOTAL: 15		N = 46 % of TOTAL: 85	
	TOTAL: N = 54			
Other 15th-cent. translations[a]	N = 0	N = 0	N = 5 Italy: 3 Unknown: 2 % of TOTAL: 33	N = 10 Provence: 1 Italy: 5 Unknown: 4 % of TOTAL: 67
	N = 0 % of TOTAL: 0		N = 15 % of TOTAL: 100	
	TOTAL: N = 15			
Entire 15th cent.	N = 9 % of TOTAL: 75	N = 3 % of TOTAL: 25	N = 53 Spain: 27 Provence: 2 Italy: 16 Unknown: 8 % of TOTAL: 69	N = 24 Spain: 1 Provence: 2 Italy: 16 Unknown: 5 % of TOTAL: 31
	N = 12 % of TOTAL: 13		N = 77 % of TOTAL: 87	
	TOTAL: N = 89			

Note: For philosophy and science, $n = 62$ (70% of all translations), with 9 translated from Arabic (15% of all translations in this area) and 53 translated from Latin (85% of translations in this area). For medicine, $n = 27$ (30% of all translations), with 3 translated from Arabic (11% of translations in this area) and 24 translated from Latin (89% of translations in this area). n.s. = not significant.

[a] That is, translations for which more precise dating is impossible.

Of particular note is that of the fifty-three scientific-philosophical works translated from Latin into Hebrew, Spain was responsible for twenty-seven, or more than half, followed by Italy with sixteen. This phenomenon has to be appreciated against the following backdrop: Whereas in Italy there was an old tradition of translations from Latin (twenty-three scientific-philosophical translations in the fourteenth century), Latin-to-Hebrew translation of scientific-philosophical works was an utterly new phenomenon in Spain (there were only two such translations in the fourteenth century).

In medicine, too, the Arabic corpus was marginalized (only three translations, as compared with thirty-seven in the fourteenth century). Most translations of medical works from Latin come from Italy (sixteen out of twenty-four), continuing the long-standing tradition there (seven translations in the thirteenth century, and eight in the fourteenth). Significantly, only one medical translation was produced in Spain in the fifteenth century, underlining the fact that in Spain the strong focus of Latin-to-Hebrew translations was on philosophy.

Recapitulating, we observe that, despite variations over time, place, and disciplines, medieval Jews held fundamentally different attitudes toward bodies of knowledge in Arabic and in Latin. Leaving the fifteenth century out of consideration (as noted, it is discontinuous with the past), we may note two main phenomena.

First, overall, there was a marked preference for translations from Arabic, which was strongest in the thirteenth century (161 works translated from Arabic vs. 29 from Latin) and less so in the fourteenth (137 vs. 96). It is true that a part of the works translated from Arabic were by Jewish authors, so their selection for translation reflects an interest in their authors' thought, not a preference for Arabic over Latin. These translations are not numerous, however, and do not alter the overall picture.[9] But simply noting that there was a preference for translations from Arabic is a misleading generalization. We need to distinguish science and philosophy on the one hand from medicine on the other. In the thirteenth century, 116 works of science and philosophy were translated from Arabic, and only 12 from Latin; in the fourteenth century, the figure is 100 versus 34 works. That is, both the number and the share of works translated from Latin increased, but not dramatically. In medicine, by contrast, the change is spectacular: In the thirteenth century, there were forty-five medical translations from Arabic and seventeen from Latin, but in the fourteenth century, the proportions were reversed, with thirty-seven translations from Arabic and sixty-two from Latin. Thus, between the twelfth and fourteenth centuries, Jewish scholars of science and philosophy exhibited a consistently strong preference for works translated from Arabic, whereas Jewish medicine increasingly turned to the Latin majority culture for its medical knowledge. The preference

9 The share of works translated from Judeo-Arabic into Hebrew, which naturally diminishes with time, is without much bearing on the overall picture. Of the 29 works in science and philosophy translated from Arabic into Hebrew in the twelfth century, 19 were by Jewish authors (nos. 1–6, 8, 15–25, 28); for the thirteenth century, the figures are respectively 161 and 19 (nos. 52, 53, 56, 57, 84–7, 98, 100, 101, 105, 106, 118, 122, 139, 159, 197, 229); for the fourteenth century, the figures are 137 and 8 (nos. 238, 245, 320, 409, 443, 446, 461, 470); in the fifteenth century, when translation from Arabic ceased almost completely, the figures are as follows: 12 and 2 (nos. 518, 535). Thus, except for the twelfth century, the share of Jewish works among those translated from Arabic is small or negligible. In medicine, too, the numbers of works by Jewish physicians translated from Arabic are of no statistical consequence: thirteenth century, 13 works (nos. 95–7, 120, 121, 143, 176, 179–81, 183, 193, 236); fourteenth century, 6 works (nos. 289–91, 369, 437, 455); fifteenth century, 1 work (no. 494). The claim that the quantitative comparisons of translations from Arabic and from Latin as presented in the tables herein are flawed inasmuch as the category of Arabic-to-Hebrew translations included works by Jewish authors was put forward by Prof. Yossef Schwartz (Tel Aviv University) during the international workshop "Medieval Hebrew Philosophical Translations: Terminology, Methodology and Conceptual Frameworks" (Departament de Ciències de l'Antiguitat i de l'Edat Mitjana, Universitat Autònoma de Barcelona, February 17–19, 2010); I am grateful to him for having pointed out this aspect and thereby allowing me to clarify the matter.

for translations from Arabic is reflected in what we know of medieval Jewish libraries. Studies of their catalogues have shown they contained very few books translated from Latin.[10]

The second significant phenomenon is that although Jewish scholars on the whole shunned Latin culture, there was a marked difference between the Midi and Italy. In Italy, there was an unbroken tradition of translating philosophical works from Latin in tandem with translation from Arabic. In the thirteenth century, of the twelve works of philosophy and science translated from Latin, five were produced in Italy and only two in Provence; in the fourteenth century, of thirty-four translations from Latin in philosophy and science, twenty-three works (68 percent) were produced in Italy and only six in Provence. In Italy we can therefore identify a "double-track appropriation" of foreign lore: Alongside Arabic-to-Hebrew translations, there were also Latin-to-Hebrew translations. Given the scarcity of translations from Latin in the Midi, it is clear that the two centers evinced different attitudes toward Latin culture. Still, it should be stressed that in Italy, too, the philosophical-scientific tradition drew mainly on works translated from Arabic and was, like its counterpart in Provence, basically an extension of Judeo-Arabic philosophical culture (I return to this point later).

This, then, is the striking cluster of phenomena with which we are concerned here: Between the twelfth and the fourteenth centuries, the Jewish cultures in southern Europe absorbed science and philosophy mainly from the distant and often outdated Arabic culture rather than from the increasingly flourishing Latin culture on their doorstep. In medical literature, the situation is rather different and more complicated; although it initially conformed to the general pattern of solid preference for the Arabic culture, in the fourteenth century, the preference was given to Latin medicine.

Appropriation from Arabic and from Latin: Comparative Qualitative Considerations

The Midi The examination of the translated philosophical and scientific literature thus bespeaks continued preference for the Arabic over the Latin culture. This cultural attitude is consistent with another facet of Jewish intellectual life in the Midi, namely that, on the whole, Jewish philosophy and science were disconnected from the Latin culture of the host society: Most Jewish scholars did not know Latin and were not acquainted with contemporary philosophy and science as practiced in their immediate surroundings. This statement is admittedly controversial. Attempts have been made to demonstrate a dependence of Jewish scientific or philosophical thinkers in the Midi on Scholastic learning prior to the fifteenth century, but in my view they have not produced convincing and clear-cut textual evidence.[11]

[10] Jean-Pierre Rothschild, "Pour évaluer la place de traductions dans la littérature hébraïque du moyen âge occidental," in Gulio Busi, ed., *We-zot le-Angelo. Raccolta di studi giudaici in memoria di Angelo Vivian* (Bologna: AISG, 1993), pp. 435–60, esp. 455–60. Rothschild (p. 455) has Steinschneider (*HÜ*, p. XXII) saying that there were more Latin-to-Hebrew translations than Arabic-to-Hebrew translations. This is a misunderstanding, for Steinschneider referred to authors, not to translations (see n. 5, this chapter). Findings based on book lists must be used with caution: Many of the Latin-to-Hebrew translations done in Italy (e.g., by Judah Romano) are preserved in Italian Hebrew manuscripts, a fact that obviously testifies to their having been used and copied.

[11] This is notably the case in the well-known monograph by the late Shlomo Pines: *Scholasticism after Thomas Aquinas and the Teachings of Hasdai Crescas and his Predecessors*; see *Proceedings of the Israel Academy of Sciences and Humanities*, Vol. 1, No. 10 (Jerusalem: Israel Academy of Sciences and Humanities, 1967). Madame Colette Sirat made strong claims for Scholastic influences on Gersonides: See Colette Sirat, Sara Klein-Braslavy, and Olga Weijers, eds., *Les Méthodes de travail de Gersonide et le maniement du savoir chez les scolastiques* (Paris: J. Vrin, 2003), passim. I refuted these claims point for point ("Gersonide, génie solitaire," ibid., pp. 291–317), showing how Gersonides' work evolved autonomously from his own research program. In private conversation, Mme. Sirat conceded that her claims were at least partly incorrect; in a newer publication, she indeed has shifted ground. See Colette Sirat and Olga Weijers, "Droit et logique: Gersonide et les juristes chrétiens," *Archives d'histoire doctrinale et littéraire du Moyen Âge* 75 (2008): 7–41. I fear, however, that the new claims are no more convincing than the earlier ones. To substantiate the thesis of Scholastic influences, some historians tried to make the claims plausible by discussing in one breath Jewish philosophers in Italy – where extensive familiarity with Scholastic philosophy

This has led to a weakened assertion: Taking their cue from a number of apparently similar discussions in Hebrew and Latin texts (for which, however, no direct Jewish acquaintance with Latin texts could be established), scholars have argued that they point to Scholastic "influence" that passed through oral exchanges (in the vernacular) between Jewish and non-Jewish scholars; the alternative explanation, namely that the similarities are due to independent parallel developments from shared premises, was rejected.[12] To account for the inconvenient fact that the Jews who were allegedly involved in these exchanges and "borrowings" never mention Latin writers or works as their sources and that their works contain no identifiable quotations, these historians have posited the existence of a social norm that forbade explicit references to Christian sources.[13] This argument is not persuasive. There is no positive evidence that such a norm ever existed, but there is strong evidence to the contrary. For one thing, many Jewish scholars in Provence do mention their contacts with Christians (see below), though these contacts did not result in significant cultural transfer. For another, in Italy (as we shall see), where a number of Jewish scholars translated Latin works of philosophy into Hebrew, they acknowledge their Latin sources openly and without embarrassment. Because there is no ostensible reason why a norm forbidding overt citation of Latin works should be in effect in Provence but not in Italy, its existence in Provence seems very unlikely.

We may conclude that although oral exchanges between Jewish and gentile scholars certainly took place, including in Provence, the resulting possible transfer of knowledge was of limited scope. Outside the medical sphere, no *substantial* Latin-to-Hebrew cultural transfer took place in the Midi. Mauro Zonta notes this in his informed and balanced overview: "As a rule, these philosophers [in Provence] show no knowledge of the most important topics discussed in contemporary Scholastic philosophy and science, and seem acquainted only with some matters of detail. Besides, when they discuss the same topics as their Latin colleagues, they use different methods."[14]

The very limited influence of Latin lore on Jewish scientific and philosophical culture in the Midi, be it through translations or through oral communication, is all the more noteworthy and intriguing inasmuch as it was by no means the case that Jewish scholars were isolated from Christian society and never met with Christians. On the contrary: In Provence there was little animosity toward Jews, and Jewish–Christian relations were relatively

is an undisputed fact (see following material) – and in Provence, where the case is very different. See, e.g., Tamar M. Rudavsky, "The Impact of Scholasticism upon Jewish Philosophy in the Fourteenth and Fifteenth Centuries," in Daniel H. Frank and Oliver Leaman, eds., *The Cambridge Companion to Medieval Jewish Philosophy* (Cambridge: Cambridge University Press, 2003), pp. 345–70; Idit Dobbs-Weinstein, "Jewish Philosophy," in A. S. McGrade, ed., *The Cambridge Companion to Medieval Philosophy* (Cambridge: Cambridge University Press, 2003), pp. 121–46.

12 On the dangers of drawing historical consequences from "parallels," see Y. Tzvi Langermann, "On the Beginnings of Hebrew Scientific Literature and on Studying History through '*Maqbilot*' (Parallels)," *Aleph* 2 (2002): 169–90. For a nuanced statement of Christian "influence" on Crescas and his school, see Daniel J. Lasker, "The Impact of Christianity on Late Iberian Jewish Philosophy," in B. D. Cooperman, ed., *In Iberia and Beyond: Hispanic Jews between Cultures* (Newark: University of Delaware Press, 1998), pp. 175–90. Lasker's thesis is that "the major impetus for the Jewish acquisition of knowledge of Christianity was the Jewish-Christian debate which took on greater urgency in the wake of increased Christian missionarizing at the end of the fourteenth century, the riots of 1391, and the Disputation of Tortosa in 1413–1414" (p. 177). According to Lasker's account, the acquaintance with Christian theology entailed Jewish acquaintance with some ideas of Scholastic philosophy, but only as a by-product, not as an end in itself.

13 Pines, *Scholasticism after Thomas Aquinas*, pp. 2, 51, referring to a "literary custom." One may wonder whether Pines's positing of a norm according to which Jewish philosophers concealed their dependence on Christian thinkers is somehow related to his Straussian inclinations.

14 Mauro Zonta, "Introduction," *Hebrew Scholasticism in the Fifteenth Century*, pp. 1–31, esp. pp. 5–10 (quotation on p. 9). See also idem, "Latin Scholastic Influences on Late Medieval Hebrew Physics: The State of the Art," in this volume.

good.[15] We know of a considerable number of Jewish literati who were in contact with Christian dignitaries and scholars, including the following individuals: Jacob ben Reuben, who in his *Milḥamot ha-Šem* (1170) describes in detail his exchanges with a Christian scholar in whose house in Gascony he stayed (more on him later); Judah Ibn Tibbon, who famously prides himself on the noblemen who came to the wedding of his son Samuel,[16] who in turn demonstrates his familiarity with both cultures when he avers that the sciences are more widely spread in Christian than in Muslim lands;[17] Gershon ben Solomon of Arles, the author of *Šaʿar ha-šamayim*, who explicitly states that he obtained scientific information from Christian scholars (the numerous *leʿazim* in his work are the visible traces of these conversations);[18] the notorious Levi ben Abraham ben Ḥayyim of Villefranche, who was acquainted with Christian interpretations of the Bible;[19] R. Menaḥem ha-Meʾiri, who also alludes to exchanges with Christian scholars;[20] Gersonides, who worked in the papal palace in Avignon, where he was in contact with Christian scholars (including Philippe de Vitry and the otherwise unknown Peter of Alexandria, who translated Gersonides' *Astronomy* into Latin in collaboration with the author);[21] Gersonides' sometime contradictor, Jedaiah ha-Penini, who refers to discussions he had with a Christian scholar about Averroes' physics;[22] the

[15] Mark R. Cohen, "Anti-Jewish Violence and the Place of the Jews in Christendom and in Islam: A Paradigm," in Anna Sapir Abulafia, ed., *Religious Violence between Christians and Jews: Medieval Roots, Modern Perspectives* (New York: Palgrave, 2002), pp. 107–37. This essay systematizes insights exposed in the same author's *Under Crescent and Cross: The Jews in the Middle Ages* (Princeton: Princeton University Press, 1994); it is now included in the revised and enlarged edition of *Under Crescent and Cross* (Princeton: Princeton University Press, 2008), pp. 271–86. A significant indicator is the fact that the "chimerical accusations" leveled against Jews in northern Europe, notably of ritual murder, had little or no echo in the south: "Chimerical fantasies were largely restricted to northern Europe, especially to the least Romanized regions. Although militant friars and other clerics tried to implant these fantasies in Mediterranean Europe, they had little success." See Gavin Langmuir, *Toward A Definition of Antisemitism* (Berkeley: University of California Press, 1990), p. 308; but also see Ram Ben-Shalom, "The Blood Libel in Arles and the Franciscan Mission in Avignon in 1453: Paris Manuscript, Héb. 631," *Zion* 63 (1998): 391–408 (in Hebrew). This conclusion is nuanced by Maurice Kriegel's microhistorical analysis showing that even in the south Jews were "untouchables" whose contact with food was believed to pollute it; Kriegel therefore construes medieval Jews in the Mediterranean as a "caste." See Maurice Kriegel, "Un trait de psychologie sociale dans les pays méditerranéens du bas Moyen Âge: le Juif comme intouchable," *Annales. Économies, Sociétés, Civilisations* 31(2) (1976): 326–30; idem, *Les Juifs à la fin du Moyen Âge dans l'Europe méditerranéenne* (Paris: Hachette, 2006), pp. 39–69 (original work published 1979).

[16] Israel Abrahams, *Hebrew Ethical Wills* (Philadelphia: Jewish Publication Society, 1976), pp. 54–92, on p. 66 (original work published 1926).

[17] Samuel Ibn Tibbon, *Maʾamar Yiqqawu ha-mayim*, ed. M. L. Bisliches (Pressburg, 1837), p. 175. The sentence is quoted in full later (near n. 70).

[18] Lothar Kopf, "The *Leʿazim* in the *Shaar haShamayim* of Gershon ben Shlomo," *Tarbiz* 24 (1955): 150–66, 274–89, 410–25; *Tarbiz* 25 (1956): 36–43 (in Hebrew); repr. in idem, *Studies in Arabic and Hebrew Lexicography*, ed. M. H. Goshen-Gottstein (Jerusalem: Magnes Press, 1976), Hebrew section, pp. 139–95. For new evidence of Gershon's contacts with Christian scholars, see my "Alchemy in Medieval Jewish Cultures: A Noted Absence," in this volume, on p. 349. Gershon also incorporated into his work passages from an early Hebrew translation of Gundissalinus's *De anima*, but there is no evidence to connect him with the translation itself. See Jacob Teicher, "Gershon ben Shlomoh e Gundissalino," *Rendiconti della R. Accademia Nazionale dei Lincei,* Series VI, 9 (1933): 6–25; idem, "The Latin-Hebrew School of Translators in Spain in the Twelfth Century," *Homenaje a Millás-Vallicrosa* (Barcelona: Consejo Superior de Investigaciones Científicas, 1956), Vol. 2, pp. 403–44.

[19] Levi ben Abraham, *Liwyat Ḥen: The Quality of Prophecy and the Secrets of the Torah,* ed. Hayyim Kreisel (Beer Sheva: Ben-Gurion University of the Negev Press, 2007), p. 285 (in Hebrew). See also the brief discussion of Levi's attitude toward Christianity in Saverio Campanini's review of the aforementioned work, *European Journal of Jewish Studies* 2 (2008): 170–5, on 173–4.

[20] Moshe Halbertal, *Between Torah and Wisdom: Rabbi Menachem ha-Meiri and the Maimonidean Halakhists in Provence* (Jerusalem: Magnes Press, 2000), p. 40 (in Hebrew); Gregg Stern, *Philosophy and Rabbinic Culture: Jewish Interpretation and Controversy in Medieval Languedoc* (London: Routledge, 2009), pp. 53–8.

[21] See, e.g., the studies on Gersonides collected in José Luis Mancha, *Studies in Medieval Astronomy and Optics* (Aldershot: Ashgate, 2006).

[22] Ruth Glasner, *A Fourteenth-Century Scientific Philosophic Controversy. Jedaiah Ha-Penini's Treatise on Opposite Motions and Book of Confutation* (Jerusalem: World Union of Jewish Studies, 1998), p. 14 (in Hebrew).

mathematician and astronomer Jacob ben Makhir, who famously collaborated closely with Christian scholars;[23] Samuel ben Judah of Marseilles, who, in the early fourteenth century, sought contacts with Christians;[24] Joseph Kaspi, who was also familiar with Christian ideas and engaged in religious polemics;[25] and Nissim ben Moses of Marseilles and Moses Narboni, both of whom allude to discussions with Christian clerics.[26] Nonetheless, the writings of these authors provide clear evidence that they were not seriously acquainted with Scholastic philosophy; the input from the surrounding Latin culture was consistently marginal.[27] (The case is of course different with the few authors who engaged in religious polemics and often knew Latin.) Thus Provençal Jewish philosophy and science remained culturally isolated: The lack of a Latin-to-Hebrew cultural transfer seems to be the result of a deep-seated cultural attitude rather than of accidental historical circumstances. In sum, then, the Hebrew scientific-philosophical enterprise in Provence was a cultural movement grounded on texts translated from Arabic and that proceeded autonomously on that basis, with only occasional and relatively superficial inputs from the surrounding majority culture.

In the fifteenth century, a change seems to have set in. It is exemplified by Isaac Nathan of Arles' large project of composing a concordance of the entire Hebrew Bible (1437 to 1447).[28] Nathan was motivated to this enterprise through his good acquaintance with concordances of the Latin Bible and their utility in religious disputes. He at first thought of translating an existing (Latin) concordance – this bespeaks his competence in Latin – but then realized that it would be of limited usefulness and opted for compiling one in Hebrew. This episode illustrates that, at that period, contacts between the Jewish and the Latin cultures had become closer than before, notwithstanding the often bitter religious polemics.

Italy Things were rather different in the Italian peninsula, and what we find there throws useful *a contrario* light on Provence. On the quantitative level, we have noted the relatively large number of Latin-to-Hebrew philosophical-scientific translations (five in the thirteenth and twenty-three in the fourteenth century). In Italy we see a fairly sustained tradition of Christian–Jewish collaboration in science and philosophy, both in the north–center region of the peninsula and in the region to the south.[29]

Consider first the region to the south. Jewish scholars versed in non-Jewish culture were not a rare phenomenon there: As early as the tenth century, two preeminent Jewish scholars were active in southern Italy and both were in close contact with gentile scholars. These are Shabbetai Donnolo, who composed his philosophical and medical books between 947 and 980, and the anonymous author of the *Josippon*, composed, on the basis of Latin sources,

[23] J. Shatzmiller, "Contacts et échanges entre savants juifs et chrétiens à Montpellier vers 1300," in *Juifs et judaïsme de Languedoc* (Toulouse: Privat, 1977), pp. 337–44.

[24] Lawrence V. Berman, "Greek into Hebrew: Samuel ben Judah of Marseilles, Fourteenth-Century Philosopher and Translator," in Alexander Altmann, ed., *Jewish Medieval and Renaissance Studies* (Cambridge: Harvard University Press, 1967), pp. 289–350.

[25] See the detailed analysis in Ram Ben-Shalom, "Between Official and Private Dispute: The Case of Christian Spain and Provence in the Late Middle Ages," *AJS Review* 27 (2003): 23–72, on pp. 24–35. See also his ethical will, "Yoreh Deʿah," in Abrahams, ed., *Hebrew Ethical Wills*, 127–61, on pp. 149–50.

[26] R. Nissim of Marseilles, *Maʿaśeh nissim*, ed. Hayyim Kreisel (Jerusalem: Mekiṣe Nirdamim, 2000), pp. 74–5, 226, et passim. On Narboni see *Beʾur le-Sefer Moreh nevuḵim*, ed. Jacob Goldenthal (Vienna, 1832), p. 32a–b (on *Guide* 2.19).

[27] To anticipate objections, let me make clear that in the phrase "the writings of these authors provide clear evidence that they were not seriously acquainted with Scholastic philosophy" the emphasis is on *seriously*: Although some authors may have had incidental acquaintance with some concept or theme of Scholastic philosophy, this acquaintance played no role in determining their intellectual agenda and thinking.

[28] Ram Ben-Shalom, "*Meir Nativ*: The First Hebrew Concordance of the Bible and Jewish Bible Study in the Fifteenth Century, in the Context of Jewish-Christian Polemics," forthcoming in *Aleph* 11 (2011).

[29] See Hermann Vogelstein and Paul Ringer, *Geschichte der Juden in Rom* (Berlin: Mayer and Müller, 1896), Vol. 1, pp. 266–70.

probably in Naples, in 953.[30] Both reflect the Mezzogiorno exception, but owing to their early date, they have no direct bearing on our inquiry.[31] Let us next take note of the Jewish and Christian scholars who collaborated closely at the court of Frederick II, *stupor mundi*, in the fourth decade of the thirteenth century: Jacob Anaṭoli, for one, befriended Michael Scot and used the Latin translations of Ptolemy's *Almagest* and of al-Farghāni's *Elements of Astronomy* to improve his translations from Arabic.[32] Two facets of the work of these scholars should be noted: the collaboration with Christian scholars and the (resulting) practice of drawing on Latin versions to improve translations from Arabic. Nothing like this ever occurred in Provence. A few decades later, in Naples in the 1270s, Moses of Salerno, the first commentator on Maimonides' *Guide*, came into contact with Nicholas of Giovinazzo and Peter of Hibernia.[33] Between February 1278 and February 1279, the Jew Faraj (Ferragut) ben Solomon of Girgenti was at the center of an intensive Arabic-to-Latin translation project commissioned by Charles of Anjou in Naples.[34] First he translated al-Rāzi's *K. al-Hāwi* (*Liber continens*); the next year he translated a *De expositionibus vocabulorum seu sinonimorum simplicis medicine* and subsequently Yaḥya Ibn Isa Ibn Jazlah's *Taqwim al-abdan*, under the title *Tacuynus de febribus*. Faraj's activity is extremely well documented and was even depicted in miniatures. Numerous copyists, some of them Jewish, gathered around him, preparing fair copies of his voluminous translations.[35] At the same time (1277–8), Moses of Palermo received instruction in Latin, at the king's expense. Later he became an Arabic-to-Latin translator in the royal service, responsible, in particular, for Ps.-Hippocrates' *Liber de curationibus infirmitatum equorum*.[36] Although these scholars did not produce translations into Hebrew as far as we know, the very existence of Jewish scholars so well versed in both Arabic and Latin bespeaks a multilingual and multicultural intellectual atmosphere that is likely to have had impact on other Jewish scholars' attitudes toward Christian culture. By the end of the thirteenth century, the poet-physician Aḥiṭub ben Isaac of Palermo translated the *Treatise on Logic* ascribed to Maimonides from Arabic into Hebrew.[37]

[30] Flusser, *Josippon*, Vol. 1, pp. 79–98.

[31] It should also be recalled that *Josippon* is a book of Jewish history, so that its Hebraization did not encounter the same opposition as that of scientific and philosophical books (see n. 4, this chapter). As we shall see, a similar remark applies to medical books.

[32] See R. Campani, "Il *Kitab al-Farghani* nel testo arabo e nelle versioni," *Rivista degli Studi Orientali* 3 (1910): 205–52; M. Zonta, "La tradizione ebraica dell'*Almagesto* di Tolomeo," *Henoch* 15 (1993): 325–50. As far as we know, Anaṭoli had no contacts with Christian scholars while still in Provence.

[33] See Caterina Rigo, "Per un'identificazione del sapiente cristiano Nicola da Giovinazzo, collaboratore di rabbi Mosheh ben Selomoh da Salerno," *Archivum Fratrum Praedicatorum* 69 (1999): 61–146.

[34] This has already been discussed in detail by M. Steinschneider, "Donnolo. Pharmakologische Fragmente aus dem X. Jahrhundert: nebst Beiträgen zur Literatur des Salernitaner, hauptsächlich nach handschriftlichen hebräischen Quellen," *Virchows Archiv für pathologische Anatomie* 39(2) (1867): 296–336. Very important is Willy Cohn, "Jüdische Übersetzer am Hofe Karls I. von Anjou, König von Sizilien (1266–1285)," *MGWJ* 79 (1935): 246–60: repr. in idem, *Juden und Staufer in Unteritalien und Sizilien* (Aalen: Scientia Verlag, 1978), pp. 50–64. I am moved to find myself referring to this work by a scholar who was my late father's teacher at the Johannesgymnasium in Breslau. Willy Cohn (1888–1941) did not leave Nazi Germany in time and kept a diary of his daily life until he was deported: *Kein Recht, nirgends. Tagebuch vom Untergang des Breslauer Judentums 1933–1941*, ed. Norbert Conrads (Cologne: Böhlau Verlag, 2006). Cohn's personal papers are now in the Central Archives for the History of the Jewish People (CAHJP) in Jerusalem. See also Cecil Roth, "Jewish Intellectual Life in Medieval Sicily," *Jewish Quarterly Review* n.s. 47 (1957): 317–35, p. 320.

[35] Cohn, "Jüdische Übersetzer," pp. 255, 257–8.

[36] Ibid., p. 259; Roth, "Jewish Intellectual Life in Medieval Sicily," p. 320. There are some doubts concerning the identification of this "Moses of Palermo" as the translator of this text; see S. Arieti, "Mosè da Palermo e le traduzioni dei trattati di mascalcia di Ippocrate indiano," in N. Bucaria, ed., *Gli Ebrei in Sicilia dal tardoantico al medioevo* (Palermo: Flaccovio editore, 1998), pp. 55–63. (I thank Mauro Zonta for this reference.)

[37] Roth, "Jewish Intellectual Life in Medieval Sicily," p. 322; Giuseppe Mandalà, "Aḥiṭub b. Yisḥaq da Palermo. Medico, filosofo e traduttore del secolo XIII," *Materia Judaica* 13(1–2) (2008): 35–61, on p. 53.

There were Jewish–Christian intellectual contacts in the center and north of the peninsula as well, albeit of a different character. In Rome, as early as 1100, Nathan ben Yeḥiel composed the ʿ*Aruḵ*; modeled on Pappias's Latin dictionary, written in central Italy about two generations earlier, it evinces Nathan's knowledge of Latin and familiarity with Latin scholarship.[38] Nathan's brother, Daniel, too, had contacts with Christian scholars.[39] A little later, beginning in 1140, Abraham Ibn Ezra was in contact with Christian scholars during his sojourn in Italy.[40] Also in the twelfth century, a Hebrew version of Guillaume de Conche's encyclopedia was prepared.[41] In the early thirteenth century, R. Isaiah of Trani the Elder's contacts with Schoolmen are demonstrated by his knowledge of the famous trope by Bernard of Chartres in which the progress of knowledge is described in terms of "dwarfs seated on the shoulders of giants."[42] In Rome, at the turn from the thirteenth to the fourteenth century, we find a number of scholars conversant with contemporary Latin philosophy: Hillel of Verona, who was in contact with Christians, including his teachers at the University of Bologna, and who draws on Thomas Aquinas and Dominicus Gundisalvi;[43] Isaac ben Mordecai, alias Maestro Gajo, Hillel's friend and physician to Pope Nicholas IV (1288–92);[44] Solomon ben Moses ben Yequtiel;[45] his son, the noted poet Immanuel of Rome, who was intimately acquainted with Italian belles lettres;[46] and Judah Romano, who knew a sizeable portion of the Scholastic philosophy of his day and who can be viewed as a veritable Hebrew-writing Schoolman.[47] Around the same time, the physician Jacob ben Eliah of Montpellier, himself a translator from Arabic into Hebrew, was active in Venice as an aide in Hebrew-to-Latin and Arabic-to-Latin translations (via the vernacular);[48] he was in turn assisted in his own Latin-to-Hebrew translations by two physicians "who considered me as a brother, and thought of me as a fellow citizen."[49] Finally, Shemariah ha-ʾIqriṭi (who can be rated "Italian" inasmuch as his family was from Rome and he himself lived in Venetian-ruled territory) was active in the

[38] I. Ta-Shma, "The Italian Background of *Sefer he-ʿAruḵ* by R. Nathan b. Yeḥiel of Rome," in *Studies in Medieval Rabbinic Literature*, Vol. 3: *Italy and Byzantium* (Jerusalem: Bialik Institute, 2005), pp. 3–8 (in Hebrew).

[39] Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 357.

[40] S. Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003), pp. 23–5 and 31–3.

[41] Georges Vajda, "Une version hébraïque de la *Summa philosophiae* de Guillaume de Conches (?)," *Revue des études juives* 115 (1956): 117–24. Vajda identified the anonymous translator as Italian.

[42] See, e.g., Abraham Melamed, *On the Shoulders of Giants: The Debate between Moderns and Ancients in Medieval and Renaissance Jewish Thought* (Ramat Gan: Bar-Ilan University Press, 2003), pp. 177–9 (in Hebrew).

[43] Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 403; Giuseppe Sermoneta, "R. Hillel b. Samuel b. Elʿazar of Verona and His Philosophical Doctrine," Ph.D. dissertation, Hebrew University of Jerusalem, 1962, pp. 23–9, 61 (in Hebrew). Hillel, too, lived in the south for many years.

[44] Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, pp. 400, 407.

[45] Ibid., Vol. 1, pp. 269–70, 395–6. See also Daniel J. Lasker, "Jewish Polemics against Christianity in Thirteenth-Century Italy," in Y. Elman and J. S. Gurock, eds., *Hazon Nahum: Studies in Jewish Law, Thought and History: Presented to Norman Lamm on the Occasion of his Seventieth Birthday* (New York: Yeshiva University Press, 1997), pp. 251–63 esp. pp. 253–8.

[46] His familiarity with Italian culture is highlighted in Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, pp. 421–40.

[47] See Giuseppe Sermoneta, "Jeudah ben Moshe ben Dani'el Romano, traducteur de Saint Thomas," in Gérard Nahon and Charles Touati, eds., *Hommage à Georges Vajda* (Louvain: Peeters, 1980) pp. 235–62; Caterina Rigo, "Un'antologia filosofica di Yehuda b. Mosheh Romano," *Italia* 10 (1993): 73–104; idem, "Yehudah b. Mosheh Romano traduttore di Alberto Magno: commento al 'De Anima' III, II, 16," *Henoch* 15 (1993): 65–91; idem, "Egidio Romano nella cultura ebraica: le versioni di Yehudah b. Mosheh Romano," *Documenti e studi sulla tradizione filosofica medievale* 5 (1994): 397–437; idem, "Yehudah ben Mosheh Romano traduttore degli Scolastici latini," *Henoch* 17 (1995): 141–70.

[48] Joseph Shatzmiller, "Jacob ben Elie, traducteur multilingue à Venise à la fin du XIII[e] siècle," *Micrologus* 9 (2001): 195–202.

[49] See his "Translator's Introduction" to the Latin-to-Hebrew translation of Abu Maʿshar's *Great Introduction*, in Kenneth Stow, "Jacob b. Eliah and the Jewish Settlement in Venetia in the Thirteenth Century," *Italia* 5 (1985): xcix–cv, on p. cv (in Hebrew). The identity of Jacob ben Eliah is a matter of dispute; for a recent discussion and

early fourteenth century and was apparently the first Hebrew translator of Peter Hispanus's *Tractatus*.[50]

Not only do these scholars draw on Latin sources, but they usually also identify their sources explicitly. They interacted personally with Christian scholars, whom they mention by name without the shadow of embarrassment. Others read Latin and translated from it, and they, too, explicitly name their sources more often than not. Nor were the copyists over the generations disturbed by the explicit and laudatory references to Christian authorities, which they reproduced faithfully.[51] Clearly, in contrast to the state of affairs in the Midi, in Italy – both in the south and in the north–center – contacts with Latin culture were numerous and were not censured. The fact that they were consistently flaunted in public rules out the thesis that an implicit social norm forbade Jews to mention Christian scholars by name.[52]

These translations of philosophical books from Latin notwithstanding, it must be emphasized that even in Italy the impact of the Latin body of knowledge on Jewish scientific-philosophical literature remained circumscribed, especially in comparison with the influence of the Arabic tradition. Just as in Provence, the foundational text of Jewish philosophy was Maimonides' *Guide* in Samuel Ibn Tibbon's Hebrew translation;[53] scholars in the philosophical tradition usually drew on Hebrew translations of Arabic works, most of which had been made in Provence. The majority of Jewish intellectuals in Italy did not read works in Latin, and their culture remained exclusively Hebrew, as the continued translation of books shows. The thirst for Hebrew translations of specifically Arabic philosophical works is illustrated by a piquant passage in Immanuel of Rome's *Maḥbarot*, which describes how scholars in Perugia broke their pledge to a passing book trader from al-Andalus to leave untouched his load of precious philosophical manuscripts, which he left in their temporary safekeeping: Moved by an insuppressible desire to partake of the latest translations of Ibn Rushd's commentaries, they broke open the crates in which the manuscripts were packed, and they copied some of them.[54] Again, in the late thirteenth century, when Jewish doctors needed access to Ibn Sina's *Qanūn*, it was translated (from Arabic) into Hebrew:[55] Even physicians, the professional group most likely to acquire Latin, could access this basic medical text in Hebrew only. We also recall that Jewish libraries contained few works translated from Latin (let alone books in Latin).[56] Moreover, despite the inputs from Scholastic philosophy, the Jewish philosophers in the Italian peninsula did not address their works of philosophy to the Schoolmen; they composed them in Hebrew, for the exclusive attention of their co-religionists. The two scholarly communities basically remained apart, both socially

overview of earlier literature see R. Chazan, "The Letter of R. Jacob ben Elijah to Friar Paul," *Jewish History* 6 (1992): 51–63. On his use of *exempla*, see Ram Ben-Shalom, *Facing Christian Culture: Historical Consciousness and Images of the Past among the Jews of Spain and Southern France during the Middle Ages* (Jerusalem: Ben-Zvi Institute, 2006), pp. 35–41, 213–28 (in Hebrew).

50 Charles Manekin, "When the Jews Learned Logic from the Pope: Three Medieval Hebrew Translations of the *Tractatus* of Peter of Spain," *Science in Context* 10 (1997): 395–430.

51 Noted in Sermoneta, "Jeudah ben Moshe ben Dani'el Romano," p. 241.

52 See the text *supra*, near n. 13; Roth, "Jewish Intellectual Life in Medieval Sicily."

53 Noted in Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 271.

54 *Maḥbaroth Immanuel haRomi* 8: 493–599, ed. Dov Yarden (Jerusalem, 1957), pp. 161–6. For an English translation and insightful analysis of this text, see Ann Brener, "Stealing Wisdom: A Story of Books (and Book-Thieves) from Immanuel of Rome's *Maḥbarot*," *Prooftexts* 28(1) (2008): 1–27. See also Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 330.

55 Chaim Rabin, "The History of the Translation of the *Canon* into Hebrew," *Melilah* 3–4 (1950): 132–42 (in Hebrew); Binyamin Richler, "The Manuscripts of Avicenna's *Kanon* in Hebrew Translation: A Revised and Up-to-Date List," *Korot* 8(3–4) (1982): 145–68.

56 See n. 10, this chapter.

and intellectually, the occasional contacts between some Jewish and Christian intellectuals notwithstanding. In Sicily, too, despite its long tradition of multilingualism, Arabic continued to enjoy a particular status and the Norman rule of "Edom" remained "radically alien."[57]

To recapitulate: Whereas in all Muslim-Arabic settings, Jews were integrated in the local (Arabic) culture, in Europe an invisible barrier separated them from the – Latin – learning of the host culture. Until the fifteenth century, the Jewish scientific-philosophical culture largely remained committed to its Arabic sources, with little input from the immediate environment. This barrier was higher in Spain and in Provence than in Italy, where a continuous tradition of collaboration between Jewish and Christian scholars existed, allowing for an influx of Scholastic texts and ideas. The continuity of the exchanges between Jewish and Christian intellectuals in Italy highlights the existence in the Midi of a *longue-durée* social norm that deterred scholars from interacting with Latin culture. It is important to keep in mind that this norm relates specifically to the *sources* of foreign knowledge – the Latin or Arabic culture – and not to the *contents*, which were not radically different in the two. Claims that Jewish scholars in the Midi drew on Latin sources but concealed this fact seem to be invalidated by the open translation and use of Latin works by a number of philosophers in Italy. The dynamics of knowledge transfer were very different in medicine: The initially strong reliance on Arabic medicine diminished, to be replaced by a dependence on Latin medicine in the fourteenth century. In what follows, I address the transfer of knowledge in philosophy and science and then in medicine.

THE SHUNNING OF LATIN: POSSIBLE CAUSES

Provence

To explain why Provençal Jews evinced different attitudes toward the Arabic and Latin languages and cultures as sources of scientific and philosophical knowledge, we should consider both sides of the comparison – the attitude toward Arabic, and the attitude toward Latin.

The Arabic language and culture were not unknown to European Jews. To begin with, they had long been dependent on the authority of the Geonim in Babylon in halakhic matters: The Jewish East was the recognized center to which scholars in Europe turned for instruction in cases of doubt, and they were well aware that the vernacular of the Geonim was Arabic. The fact that Arabic – in fact, Judeo-Arabic – was employed in halakhic contexts ipso facto made it legitimate and an organic part of the Jewish culture.

Another strong factor was the existence of a flourishing Judeo-Arabic culture in neighboring al-Andalus. This culture legitimized Arabic culture, thanks to its double-faceted character: Arabophone, but also the source of an impressive and prestigious Hebrew literature that looked to Arabic for its models. The existence in Spain of this literary culture in Hebrew, the lingua franca of all Jews, doubtless facilitated the introduction of Arabic lore into Provence. Even before the era of the intensive cultural transmission, Provençal Jews were aware of and impressed by the Hebrew component of the Spanish Jewish literary corpus, notably the poetry. This factor was of course enhanced by the political and geographical proximity, which brought many Spanish scholars to Provence, either temporarily (e.g., Abraham Bar Ḥiyya, Abraham Ibn Ezra) or as immigrants (e.g., the Tibbonids and the Qimḥis). As a result of such personal contacts with the Midi, Spanish scholars became instrumental in

[57] Henri Bresc, *Arabes de langue, juifs de religion. L'évolution du judaïsme sicilien dans l'environnement latin, XIIe–XVe siècles* (Paris: Éditions Bouchéne, 2001), pp. 37, 42, 46.

a massive Arabic-to-Hebrew transfer of knowledge: In its first phase, scholars (notably the two Abrahams just mentioned) wrote Hebrew works based on Arabic learning; subsequently, scholars of Andalusian origin who immigrated to the Midi translated Judeo-Arabic and Arabic works into Hebrew. Thus, the existence next door, as it were, of a developed Hebrew culture grounded in Arabic knowledge was certainly a weighty factor in making Arabic language and learning legitimate and even attractive in Provence. It seems difficult to imagine that Provence would have opened up so rapidly to any Arabic learning – and to the "alien" wisdom that came with it – had the Hebrew culture of al-Andalus not prepared the way.

Particularly important in this context are the works of Hebrew grammar. Judah Ibn Ḥayyug's grammatical works were first translated into Hebrew (by Moses Gikatilla) as early as 1050–75 and again by Abraham Ibn Ezra a century later. Through them, and through grammatical works composed in Hebrew by Arabophone Spaniards in the middle of the twelfth century (Abraham Ibn Ezra and Solomon ben Abraham Ibn Parḥon), the Provençal Jewish scholars learned that the Arabic language was a sister language to Hebrew, indeed a sibling to defer to, for Jewish writers in al-Andalus repeatedly praised the richness and excellence of the Arabic language and its superiority to Hebrew.[58] It transpired that mastery of Hebrew required knowledge of Arabic and that biblical exegesis often appealed to Arabic. Indeed, the new scientific Hebrew grammar, indispensable for the correct understanding of the sacred texts, was based on Arabic grammar. Similarly, the Jewish legal authorities and philosophers in the Maghreb and al-Andalus all wrote in Arabic: Isaac Israeli, Rabbenu Nissim, Isaac Alfasi, Solomon Ibn Gabirol, Isaac Ibn Ghiyat, Judah Halevi, Baḥya Ibn Paquda, Maimonides, and many others.[59] Their halakhic works, Bible commentaries, and philosophical tracts endowed Arabic with an unassailable religious legitimacy, reinforcing the approbation it already had received from the Geonim. Together, these factors made Jewish Provence think of Arabic language and culture as something familiar or a rich relative of Hebrew.

These considerations help us to understand why the attitude toward Arabic and its culture was so different from the attitude toward Latin. No Jewish book had ever been composed in Latin. Moreover, whereas Arabophone Jews were familiar with literary Arabic long before they studied it properly, if only because of its use in the synagogue (e.g., Saadia's *Tafsir*), in Christian Europe the access to the cultural language of the majority culture was fraught with difficulties. Arabic was usually learned, read, and written in Hebrew characters, whereas access to Latin required learning a new alphabet and script. A minor detail seems revelatory here. Jews transcribed in Hebrew characters works in all the languages they used: Judeo-Arabic and Yiddish, of course, but also many other vernaculars. This can be taken as an indication that Jews to some degree assimilated the corresponding languages and cultures. By contrast, no Latin book ever seems to have been transcribed in Hebrew characters.[60] This bespeaks a profound estrangement between Jews and the Latin language and culture.

[58] See A. S. Halkin, "The Medieval Jewish Attitude Toward Hebrew," in A. Altmann, ed., *Biblical and Other Studies* (Cambridge, MA: Harvard University Press, 1963), Vol. 1, pp. 233–48; N. Allony, "The Reflection of the Revolt against 'Arabiyyah' in Medieval Jewish Literature," in Chaim Rabin et al., eds., *Sefer Meir Wallenstein* (Jerusalem: *Qiryat Sefer*, 1979), pp. 80–136 (in Hebrew); Norman Roth, "Jewish Reactions to the 'Arabiyya and the Renaissance of Hebrew in Spain," *Journal of Semitic Studies* 28 (1983): 63–84.

[59] See M. Steinschneider, *Die arabische Literatur der Juden. Ein Beitrag zur Literaturgeschichte der Araber, grossenteils aus handschriftlichen Quellen* (Frankfurt: J. Kauffmann, 1902).

[60] Several works of religious polemics contain short quotations in Latin, transcribed in Hebrew letters as, e.g., *Sefer Joseph ha-Meqanneh* by Joseph Official (mid-thirteenth century) – see Judah Rosenthal, ed., *Sepher Joseph Hamekane* by R. Joseph b. R. Nathan Official (Jerusalem: Mekiṣe Nirdamim, 1970), Introduction, p. XXVII; and *Sefer Niṣṣaḥon Yashan* (end of thirteenth century) – see David Berger, ed. and trans., *The Jewish Christian Debate in the High Middle Ages: A Critical Edition of the* Nizzahon Vetus (Philadelphia: The Jewish Publication Society of America, 1979), Sections 228–32 (pp. 153–6 of the Hebrew section). More examples were presented at the conference "Latin into Hebrew: The Transfer of Philosophical, Scientific, and Medical Lore from Christian to Jewish Cultures in Southern Europe (12th–15th Centuries)," organized by R. Fontaine and me in Paris,

Moreover, Arabic-to-Hebrew transfer began with translations of Judeo-Arabic works (grammar and religious philosophy), which aroused interest in other Arabic works, Jewish and non-Jewish, that were translated in due course. In the absence of a parallel "Judeo-Latin" culture, no similar window could open in the direction of Latin culture, which thus exerted no cultural pull on Jewish intellectuals. Further, unlike Arabic, Latin was linguistically unrelated to Hebrew and of little use in understanding the authoritative texts of Judaism, with the exception of some foreign terms in the Talmud. Last but not least, the differences in the public spheres in the two cultures, and the place of Jews in them, must be taken into account. In the Muslim-Arabic world, Jews were welcome in the public arena and often participated in open intellectual exchanges.[61] In Provence, by contrast, there was no similar public arena, and the rare purely intellectual exchanges between Jews and Christians (those that excluded religious polemics) were relegated to the private sphere.[62] Thus, all the factors that converged to expedite the assimilation of Arabic and its literature were absent in the case of Latin.

In addition, there were also factors that actively alienated Jews from Latin culture and language. (Obviously, these factors were mostly present throughout Christendom, not only in Provence.) The most widespread use of the Latin language was in the Christian liturgy and in religious and ecclesiastical institutions (monasteries, universities, etc.). Scholars have often emphasized that medieval Jews felt a stronger antagonism to Christianity than to Islam; the estrangement from Latin is thus an aspect of a much broader historical phenomenon.[63] This decisive factor, whose description and analysis have evolved over time in part as a function of the historians' own *Sitz im Leben*,[64] cannot be discussed here, but I will adduce several salient

December 7–9, 2009. These examples will be presented in a similarly entitled volume in preparation; they do not alter the overall picture.

61 A well-known account by the Andalusi historian al-Ḥumaydī (d. 1095) from his visit to Baghdad mentions gatherings of intellectuals of different faiths and philosophical convictions in which only "rational arguments" were admitted, whereas all proofs "from books" were proscribed. First published by R. Dozy, "Review of Ernest Renan, *Averroès et l'averroïsme*," *Journal asiatique*, 5th series, 2 (1853): 90–6, on p. 93; English translation in Alexander Altmann, "Translator's Introduction," *Saadia Gaon, Book of Doctrines and Beliefs*, ed. and trans. A. Altmann, in *Three Jewish Philosophers* (New York: Atheneum, 1969), Part 2, pp. 11–22, on pp. 13–14. For a summary and additional evidence, see Joel L. Kraemer, *Humanism in the Renaissance of Islam* (Leiden: Brill, 1986), pp. 59–60. Kraemer makes this conclusion: "Cosmopolitanism, tolerance, reason and friendship made possible the convocation of these societies, devoted to a common pursuit of the truth and the preservation of ancient wisdom, by surmounting particular religious ties in favor of a shared human enterprise" (ibid., p. 60).

62 I am grateful to Judith Olszowy-Schlanger for drawing my attention to the importance of this point. Religious disputations were rarely free, and Jews tended to avoid them; see Ben-Shalom, "Between Official and Private Dispute" (see n. 25). Religious polemics "according to reason" as a factor enhancing acculturation in Provence are studied in my paper "Arabic into Hebrew: The Appropriation of Secular Knowledge in Twelfth-Century Provençal Judaism," in David Freidenreich and Miriam Goldstein, eds., *Border Crossings: Interreligious Interaction and the Exchange of Ideas in the Islamic Middle Ages* (Philadelphia: University of Pennsylvania Press, forthcoming).

63 The classic statement is Jacob Katz, *Exclusiveness and Tolerance: Studies in Jewish-Gentile Relations in Medieval and Modern Times* (Oxford: Oxford University Press, 1961). Katz discusses only Ashkenaz and Tzarfat, but many of the observations apply to Christian culture generally. D. Berger points out that in the English version of Katz's work the Jewish anti-Christian statements are milder; see his "Jacob Katz on Jews and Christians in the Middle Ages," in Jay M. Harris, ed., *The Pride of Jacob: Essays on Jacob Katz and his Work* (Cambridge, MA: Harvard University Press, 2002), pp. 41–63 (a similar statement appears in D. Lasker's paper, referred to in n. 64). A rosier picture of Jewish–Christian intellectual relations is implied by Ben-Shalom, *Facing Christian Culture* (see n. 49); although the material analyzed there is rich and enlightening, I think that the generalizations are extrapolated on the basis of episodes that took place in different places and times.

64 Amos Funkenstein, "Jewish History among the Thorns," in David Biale and Robert S. Westman, eds., *Thinking Impossibilities: The Intellectual Legacy of Amos Funkenstein* (Toronto: University of Toronto Press, 2008), pp. 309–27; this is the revised English version of the Hebrew original published in *Zion* 60 (1995): 335–47. Also see Daniel J. Lasker, "From Victim to Assassin: Jewish-Christian Relations in the Middle Ages – Historiography in the Mirror of the State of Israel," *Zion* 74 (2009): 95–108 (in Hebrew).

aspects. For one thing, it is clear that inasmuch as the Christian religion convicted the Jews of deicide and maintained that they deserved their degraded condition, the Jews perceived Christian institutions as a source of danger. It stands to reason that the menacing cloud that surrounded the Christian religion and institutions would have extended to its language and culture. The constant pressure on Jews to convert (usually absent under Islam before the Almohads) must have enhanced the sense of danger that attached to Latin. For medieval Jews, Latin was not a language that conveyed information and ideas neutrally. This is reflected by the common designations of the Latin language as *lašon noṣri* or even more disdainfully as *lešon ha-ʿarelim*; by contrast, Arabic is called *lešon he-ʿarav* (or *lešon ha-Yišmeʿelim*), excluding any religious reference.[65] Nor should it be forgotten, as Steinschneider argued long ago, that in the Jewish collective memory Latin was the language of the Romans who destroyed the Temple, thereby creating the Jewish exile with all its sorrow and suffering.[66]

To this, the obvious social barriers must be added. A Jewish scholar who wanted to learn Latin would have had to approach a Christian, probably a clergyman or a convert, and ask for private instruction. The road to Latin thus passed via the social groups that Jews shunned most. In addition, within the Jewish community, such a step could be interpreted as a possible prelude to conversion and would have been made difficult by social pressure. This holds even for physicians, the social group whose ties with the gentile society were closest, as we shall see: As far as we know, young Jews studied medicine privately under Jewish masters; until Jews first entered universities in the late fourteenth century, no Jewish physician learned his art directly from a Christian teacher.[67]

Not only were there strong factors promoting the assimilation of Arabic culture in Provence as well as other factors that hampered an analogous Latin-to-Hebrew cultural transfer; the very assimilation of Arabic culture reinforced an attitude that discouraged interest in Latin culture. The Judeo-Arabic or Arabic works through which the Jews of Provence became acquainted with "foreign knowledge," and especially many of the translators' prefaces that accompanied them, bespeak a feeling of strong confidence in the excellence of Arabic culture. The cultural intermediaries who initiated the transmission of Arabic culture to Provence are particularly relevant here. They were all of Spanish origin: Abraham Bar Ḥiyya and Abraham Ibn Ezra, followed by the Tibbonids, the Qimḥis, and others. These émigrés continued to value their roots in al-Andalus and to pride themselves on their origins and culture. Although driven into exile by fanatical Muslims, they did not turn their back on Arabic culture; on the contrary, they continued to perceive it as their own, even after their forced emigration. In the Iberian peninsula, the Jews' relatively secure position in society – call it *convivencia*[68] or something else – gave them the feeling that they were part of the majority culture, and they continued to feel committed to it even in "exile." The case of Maimonides, who throughout his life referred to al-Andalus as "our place," is a good illustration of this cultural attitude.[69] So is the case of Samuel Ibn Tibbon, who wrote (ca. 1231), "I saw that the true sciences have become ever more widespread among the nations in whose

65 A similar point is made in Cohen, *Under Crescent and Cross*, pp. 133–4.
66 Steinschneider, *HÜ*, p. 461.
67 I am grateful to Joseph Shatzmiller for his advice on this point.
68 See Vivian B. Mann, Thomas F. Glick, and Jerrilynn D. Dodds, eds., *Convivencia: Jews, Muslims, and Christians in Medieval Spain* (New York: George Braziller and the Jewish Museum, 1992).
69 Joshua Blau, "Maimonides' 'At Our Place in al-Andalus' Revisited," in Carlos del Valle, Santiago García-Jalón, and Juan Pedro Monferrer, eds., *Maimónides y su época* (Madrid: Sociedad Estatal de Conmemoraciones Culturales, 2007), pp. 327–40. This is the full text of a paper for which an abstract had previously been published under a very similar title: "'At Our Place in al-Andalus,' 'At Our Place in the Maghreb,'" in Joel L. Kraemer, ed., *Perspectives on Maimonides: Philosophical and Historical Studies* (Oxford: Oxford University Press, 1991), pp. 293–4; Kriegel, *Les Juifs à la fin du Moyen Âge*, pp. 147–8.

countries and under whose rule I reside, more than they are widespread in the lands of Ishmael. I therefore perceived a great need to enlighten the eyes of the scholars with whatever God granted me to know and to understand of His words."[70] Significantly, the cultural source on which Ibn Tibbon draws is Ibn Sinā's natural science and not the sciences of the "the nations in whose countries and under whose rule" he resided:[71] In the competition he perceived between the Arabic and Latin knowledge systems, Ibn Tibbon clearly felt he belonged to the former. The most remarkable aspect of this shared cultural attitude is the fact that in families of Spanish origin, knowledge of Arabic was transmitted from father to son over a number of generations, creating persistent "enclaves" of Judeo-Arabic culture in the Midi.[72] Judah Ibn Tibbon's ethical will exemplifies this transmission of Spanish norms and cultural values from one generation to the next.[73] In sum, then, the Spanish émigrés who came to Provence and initiated the Arabic-to-Hebrew cultural transfer did so in the feeling that it was their own culture that they were passing on; along with its bodies of knowledge, they transmitted its high self-image and values.

Confident in the excellence and superiority of their culture, then, these cultural brokers conveyed to the Jewish scholars of Provence a feeling that Arabic science and philosophy were the best knowledge available. This implied that it was pointless for them to assimilate anything from the inferior (and spurned) Latin culture. To put it in a different way, the prestige of Arabic culture in general and of Judeo-Arabic culture in particular produced a tacit understanding that it was self-sufficient, so that acquiring knowledge from Latin sources was unnecessary. Judah Romano, one of the few translators from Latin (active in Italy), remarked that he produced his translations from Latin to refute a dominant perception among Jews that "truth and insight are absent from the gentile nations, especially from the Christians."[74] In short, according to this hypothesis, a widespread feeling that Arabic culture was superior to the Latin spawned an intellectual climate that stifled potential interest in Latin culture. This may have been reinforced by the fact that most Jews in the Midi did not live in centers of learning (Montpellier and Toulouse being the main exceptions), which reduced the prospects of occasional intellectual encounters. This account is confirmed by a comparison with the assimilation of medical knowledge: If in the thirteenth century Arabic medicine enjoyed high prestige and translations from Arabic were predominant (forty-five vs. seventeen), in the fourteenth century, when the prestige of Latin medicine exceeded that of its Arabic counterpart, the tide turned (thirty-seven translations from Arabic vs. sixty-two from Latin).

The atypical interactions between Jewish and Christian astronomers – a key field of Jewish scientific activity – conform to this hypothesis.[75] There were many cases in which Jewish astronomers collaborated with their Christian counterparts or worked under high patronage, including Abraham Bar Ḥiyya, Abraham Ibn Ezra, Jacob Anaṭoli, and Jacob ben Makhir; Isaac ben Sid and Judah ben Moses ha-Kohen, both of whom worked for Alfonso the Wise; Jacob ben David Bonjorn; and, last but not least, Abraham Zacut.[76] Two facets of

70 Samuel Ibn Tibbon, *Ma'amar Yiqqawu ha-mayim*, p. 175.

71 See Gad Freudenthal, "Samuel Ibn Tibbon's Avicennian Theory of an Eternal World," *Aleph* 8 (2008): 41–129.

72 Kriegel, *Les Juifs à la fin du Moyen Âge*, p. 148; Eleazar Gutwirth, "History, Language and Sciences in Medieval Spain," in the present volume.

73 See n. 16.

74 Cited by Marc Saperstein, "Context: Thirteenth to Fifteenth Centuries," in Daniel H. Frank and Oliver Leman, eds., *History of Jewish Philosophy* (London: Routledge, 1997), pp. 294–330, on p. 299. See Steinschneider, *HÜ*, p. 490; Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 441; Sermoneta, "Jeudah ben Moshe ben Dani'el Romano," p. 236. Judah's statement complements the numerous statements by promoters of the appropriation of "foreign wisdom" that Jews must not lag behind the nations in secular knowledge.

75 I am indebted to Bernard R. Goldstein for his advice on the theme discussed in this paragraph.

76 For a systematic survey, see José Chabás, "Interactions Between Jewish and Christian Astronomers in the Iberian Peninsula," Chapter 7 in this volume.

this Jewish–Christian interaction must be pointed out. On the one hand, as a mathematical science, astronomy was religiously neutral, making it easier for astronomers of the two faiths to collaborate.[77] On the other, it is noteworthy that this collaboration centered on the transfer of Arabic knowledge into Latin but did not lead to a significant assimilation of Latin astronomy by Jewish astronomers. In the twelfth and thirteenth centuries, there were no astronomical texts in Latin that would have been good candidates for translation into Hebrew: The most widely used astronomical tables in Latin were the Toledan Tables, material that was available directly in Hebrew sources. However, even when the state of astronomical art was higher in Latin than in Hebrew, there was no transfer of knowledge, although some Latin tables were introduced into Hebrew astronomy (there are no fewer than five sets of tables in Hebrew related to the Alfonsine Tables[78]). A notable case in point is Levi ben Gershom (Gersonides), who was active at the papal court in Avignon in matters astronomical for many years and clearly had ample opportunities to familiarize himself with his hosts' astronomical learning. Nevertheless, Gersonides is unaware of the contemporary advances in Latin astronomy (notably the theory of trepidation and the Alfonsine Tables in Latin, disseminated from Paris beginning in the 1320s).[79] The reason for Jewish scientists' disinterest in Latin astronomy seems to be that they believed their own body of knowledge, which derived from Arabic, to be superior to it. The case of astronomy thus nicely fits into the general hypothesis suggested herein.

Another factor to be taken into consideration is that the transfer of problematic "alien wisdom" was accompanied by its religious legitimization. The intrinsic legitimacy of the religiously oriented Judeo-Arabic works translated in Hebrew radiated onto the Greco-Arabic scientific and philosophical corpus in which they were grounded. Maimonides' *Guide* and other works of Jewish religious philosophy that explicitly drew on them legitimized Aristotle, along with Ibn Rushd, his commentator.[80] No Latin writer was ever legitimized in this way. The opposite was the case. Jewish intellectuals came into contact with Latin thought chiefly in the context of formal and informal religious polemics.[81] It therefore stands to reason that Jews usually perceived Latin philosophy as an intellectual weapon targeting Judaism. Latin philosophy was not perceived as a neutral body of knowledge but as fundamentally Christian. Owing to its distinctive social role, I submit, for Jews Latin philosophy was an alien and daunting lore, the very opposite of its familiar Arabic counterpart. Even in Italy, the few Jewish scholars who took up Scholastic philosophy had to legitimize this move and were criticized (by other philosophically inclined scholars) for relying on so-called alien sources – the implication being that Arabic philosophy was natively Jewish.[82]

The different attitudes toward Arabic and Latin knowledge are exemplified by the intellectual trajectory of Jacob ben Reuben, the author of *Milḥamot ha-Šem* (ca. 1170). Jacob ben Reuben was a Jewish scholar who happened to live for a time in Gascony, where a friendly

77 Bernard R. Goldstein, "Astronomy as a 'Neutral Zone': Interreligious Cooperation in Medieval Spain," *Medieval Encounters* 15 (2009): 159–74.

78 José Chabás and Bernard R. Goldstein, *Astronomy in the Iberian Peninsula: Abraham Zacut and the Transition from Manuscript to Print* (Philadelphia: American Philosophical Society, 2000), p. 22.

79 See Freudenthal, "Gersonide, génie solitaire."

80 Moderate conservatives, like Abba Mari of Lunel, fully recognized the usefulness of Aristotle for faith and consequently were ambivalent about him. See Gad Freudenthal, "Holiness and Defilement: The Ambivalent Perception of Philosophy by Its Opponents in the Early Fourteenth Century," *Micrologus* 9 (2001): 169–93; repr. in idem, *Science in the Medieval Hebrew and Arabic Traditions* (Aldershot: Ashgate, 2005), Essay II.

81 For an updated comprehensive overview, see Daniel J. Lasker, "Introduction," in *Jewish Philosophical Polemics against Christianity in the Middle Ages* (Oxford: The Littman Library of Jewish Civilization, 2007). See also Ben-Shalom, "Between Official and Private Dispute" (see n. 25).

82 This, for example, is the case for R. Hillel of Verona, as pointed out by Sermoneta, "R. Hillel b. Samuel b. Elʿazar of Verona," pp. 23–31. Hillel was taken to task notably by Immanuel of Rome and Zeraḥyah ben She'altiel Ḥen.

clergyman offered him shelter and engaged him in religious discussions.[83] The priest frequently adduced philosophically grounded arguments that Jacob lacked the education to refute. For succor he turned to treatises of Jewish religious philosophy. He in fact draws on two works: Baḥya Ibn Paqudah's *Duties of the Hearts*, which he used in the just-completed translation by Judah Ibn Tibbon (1161), and Saadia's *Beliefs and Opinions*, in the old paraphrastic translation (Judah Ibn Tibbon's translation was not completed until some fifteen years later). For the present discussion, the salient point is that, in the course of his exchanges with his Christian mentor, Jacob learned Latin, as demonstrated by translated passages from the New Testament embedded in *Milḥamot ha-Šem*.[84] Nonetheless, when confronted with the arguments against Judaism and needing intellectual means to refute them, Jacob did not look into the Latin books that his interlocutor was using and that he, now fluent in Latin, certainly could have read; rather, he turned to Judeo-Arabic works of Jewish religious philosophy, which he read in Hebrew. Indeed, the fact that Baḥya's and Saadia's works were useful in religious polemics may have played a role in the decision to translate them.[85] This story instantiates the general case: When Jewish intellectuals in Provence perceived a need to acquire philosophical knowledge, they did not look for it in the Latin culture of their Christian neighbors. Instead, they drew on the prestigious works of religious and "general" philosophy, composed in Arabic by their brethren or by Muslims.

Italy

We should now ask how the Italian case fits into this picture: Why could oral exchanges with Christian scholars often take place there? Why were some Jewish intellectuals in Italy proficient in Latin and in Scholastic literature, a phenomenon that has no parallel in Provence? After all, the general reticence vis-à-vis Christianity as described herein equally applies in the Provençal and the Italian contexts.[86]

We should consider the southern parts of the Italian peninsula and its north and center separately. Concerning the former, one crucial aspect is quite obvious, namely the prevalent multilingualism. In Sicily, trilingualism was *de rigueur*, among Jews and non-Jews alike. As Henri Bresc points out, it was the autonomy of the communities of Sicily (itself a legacy of Arab rule) that produced "more than simple tolerance" of the various languages.[87] Contemporaries confirm this statement. "Most remarkable is what has happened to the Jews in all Sicily," Abraham Abulafia wrote in 1285: "they do not speak only Italian, or Greek, these being the languages of those together with whom they dwell, but in addition they have preserved the Arabic tongue, which they learned in former times when the Ishmaelites dwelled there."[88] This cultural ambiance accounts notably for the early appropriation of foreign lore

83 Jacob ben Reuben, *Milḥamot ha-Šem*, ed. Judah Rosenthal (Jerusalem: Mosad ha-Rav Kook, 1963). For the date and place of composition, see the Introduction, pp. viii–x. Other historians believe the book was written in Huesca in the north of the Iberian peninsula. See Carlos del Valle, "Jacob ben Rubén de Huesca. Polemista. Su patria y su época," in Carlos del Valle Rodriguez, ed., *Polémica Judío-Cristiana. Estudios* (Madrid: Aben Ezra Ediciones, 1992), pp. 59–65. See also David Berger, "Gilbert Crispin, Alan of Lille, and Jacob ben Reuben: A Study in the Transmission of Medieval Polemic," *Speculum* 49 (1974): 34–47.

84 Judah M. Rosenthal, "A Hebrew Translation of the Gospel of Matthew by Jacob ben Reuben," *Tarbiz* 32 (1962): 48–66 (in Hebrew).

85 I made this suggestion in my paper "Arabic into Hebrew: Religious Polemics and the Appropriation of Secular Knowledge in Twelfth-Century Provençal Judaism" (see n. 62).

86 The discussion that follows derived much benefit from exchanges with Maurice Kriegel (Paris), to whom I am very grateful.

87 Bresc, *Arabes de langue, juifs de religion*, p. 32.

88 Quoted from Cecil Roth, "Jewish Intellectual Life in Medieval Sicily," p. 319. The passage is in Abulafia's *Oṣar eden ganuz*, ed. Amnon Gross (Jerusalem, 1990), p. 313 (available online at http://hebrew.grimoar.cz/abulafia/

as witnessed, for example, in the cases of Shabbetai Donnolo and the author of *Josippon*. It also sheds light on later Jewish–gentile interactions in the south. In the late thirteenth century, Moses of Salerno's close contacts with Nicola da Giovinazzo are a typical product of the specific social setting in southern Italy.[89]

Another noteworthy circumstance specific to the south is that Jewish scholars often worked under the patronage of rulers: The different, even opposite, goals of their respective cultural politics notwithstanding, the Hohenstaufen and the Angevin rulers employed Jews as cultural intermediaries.[90] The protégés of Frederick II and of Charles of Anjou have already been mentioned and can be supplemented by those who worked for Robert of Anjou in the early fourteenth century (Qalonymos ben Qalonymos,[91] Shemariah ha-ʾIqriṭi,[92] and perhaps Judah Romano[93]). True, many of these Jewish scholars were émigrés from al-Andalus or Provence and knew Arabic before they reached the respective courts. Further, they were employed in their respective courts in tightly institutionalized contexts, so that their exchanges with Christian scholars did not depend on wider social and cultural attitudes. Still, the unique multilingualist ambiance in the south was certainly conducive to the organization of a multicultural activity as it existed in the southern Italian courts and to the Jewish learning of Latin and interaction with Christian scholars already noted. In any event, the social pattern of patronage, similar to that which had such beneficial effects on Jewish culture in al-Andalus, spurred collaboration between Jewish and non-Jewish scholars and facilitated the appropriation of knowledge from Latin sources.[94] This kind of patronage had no parallel in Provence.

As for northern and central Italy, the circumstances that allowed some Jewish intellectuals to be integrated in gentile intellectual life have primarily to do with what has been called the "Italian cultural exception" in the Late Middle Ages.[95] This subject cannot be explored here

ocar_eden_ha-ganuz.htm; accessed June 10, 2010); I am grateful to Prof. Harvey (Chaim) Hames for his advice on this passage.

89 Rigo, "Per un'identificazione del sapiente cristiano Nicola da Giovinazzo" (see n. 33).

90 For Frederick II's politics of cultural "subversion," see the classic article R. A. Gauthier, "Notes sur le début (1225–1240) du premier 'averroïsme,'" *Revue des sciences philosophiques et théologiques* 66 (1982): 321–74. On the cultural politics of the Angevins, see Alessandro Barbero, "Éducation et culture à la cour angévine (1266–1343)," in Isabelle Heullant-Donat, ed., *Cultures italiennes* (*XIIe-XVe siècles*) (Paris: Les Éditions du Cerf, 2000), pp. 145–68. On the deterioration of the state of Jews under Angevin rule, see Joshua Starr, "The Mass Conversion of Jews in Southern Italy (1290–1293)," *Speculum* 21 (1946): 203–11.

91 Qalonymos b. Qalonymos hailed from Provence, where he had translated from Arabic into Hebrew. There is no reason to think that he knew Latin while still in the Midi. He may have learned it after moving to Italy (shortly after 1322) to work for Robert, just as Moses of Palermo had done a generation earlier at the same court (see n. 36). On Qalonymos's activity in Italy, see Jefim (Hayyim) Schirmann, *The History of Hebrew Poetry in Christian Spain and Southern France*, ed. Ezra Fleischer (Jerusalem: The Magnes Press, 1997), pp. 520–4 (in Hebrew). That Qalonymos ben Qalonymos is indeed identical with "Calo Calonymos" who made the partial Latin translation of Averroes' *Tahâfut al-tahâfut* (*Destructio destructionum*) has been conclusively shown (ibid., p. 521 n. 29). This translation (the last of Qalonymos's known translations) is dated Arles, April 18, 1328, which is after Qalonymos had lived in Naples for a few years.

92 See M. Steinschneider, "Robert von Anjou und sein Verhältnis zu einigen gelehrten Juden," *MGWJ* 48 (1904): 713–17; Aaron Ahrend, ed., *Elef ha-magen* (Jerusalem: Mekiṣe Nirdamim, 2003), pp. 23–4 (in Hebrew).

93 See Steinschneider, *HÜ*, pp. 263–4; Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 442.

94 In the north, too, some scholars enjoyed patronage, such as Abraham Ibn Ezra, Zeraḥyah b. Sheʾaltiel Ḥen, Immanuel of Rome, Nathan ha-Meʾati, and even Abraham Abulafia. See Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 275. However, it was extended by wealthy Jews and had no influence on Jewish–Christian contacts.

95 For an overview see the articles gathered in Heullant-Donat, ed., *Cultures italiennes* (*XIIe-XVe siècles*). See also the informative survey in Emanuele Coccia and Sylvain Piron, "Poésie, sciences et politique. Une génération d'intellectuels italiens (1290–1330)," *Revue de synthèse*, 6th series, 129 (2008): 549–86.

in any depth, and I content myself with a few comments. A first again concerns language. In Italy, the Latin–vernacular bilingualism started earlier than elsewhere in Europe and with it the early use of the vernacular in cultural life, a phenomenon culminating in Dante. (This linguistic phenomenon is in turn linked to the early rise of a lay intellectual stratum in Italy, a point to be considered immediately.) Now Jews, too, were conversant with the Italian vernaculars, not only as a spoken but also as a written language (albeit in Hebrew script).[96] Thus, toward the middle of the thirteenth century, Judah ben Benjamin Anaw introduced the reading of the weekly Torah portion in Italo-Romance translation during the synagogue service,[97] an innovation paralleled in the evolution of the Judeo-Arabic culture but not in Provence; prayer books, too, were occasionally in Italian.[98] In addition, if in most places Jews kept debt ledgers in Hebrew, interspersed with some vernacular words (transcribed in Hebrew characters), in Italy a high proportion of such books were in the vernacular;[99] songs in Italian were sung at festive events.[100] Someone like Immanuel of Rome was truly bicultural and composed poems in Italian. All this shows that, in the Italian peninsula, Jews read and wrote in the vernacular (in Hebrew characters) and were thus closer to their neighbors' language and the culture more than elsewhere in Europe. This cultural integration paved the way for Jewish intellectuals to establish fruitful cultural contacts with their Christian counterparts. Immanuel of Rome and Dante's friendship (whether real or only a plausible legend[101]) is emblematic of intellectual contacts that were impossible in other contexts. The close contacts between Jewish and gentile scholars in the realm of philosophy and science are reflected in the Italo-Romance glossaries and the use of synonyms often incorporated in philosophical works (e.g., Moses of Salerno, Hillel of Verona);[102] in Provence, by contrast, glossaries and the inclusion of vernacular synonyms in philosophical works were quite rare.[103]

The important role of the vernacular in Italy is connected to the early rise there of a new social group – that of the lay intellectuals. Whereas before the twelfth century lay, intellectuals constitute a tiny mostly aristocratic minority, the Late Middle Ages saw the rise in Italy of a new class of lay, professional intellectuals.[104] Ruedi Imbach has described the distinctive characteristics of the lay intellectual, specifically the lay philosopher; he has also highlighted what distinguishes lay from clerical philosophical knowledge and the significance of the

[96] Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 273 ("Grosser Wert wurde auf die Kenntnis und Beherrschung des Italienischen gelegt"), pp. 339–40. As early as the third to fifth centuries, Italian Jews used Greek or Latin on tombstones, which is evidence of their early linguistic and cultural integration. See M. Güdemann, *Geschichte des Erziehungswesen und der Cultur der Juden in Italien während des Mittelalters* (Vienna: Alfred Hölder, 1884; repr. Amsterdam: Philo Press, 1964), pp. 1–8; Hebrew translation: *Ha-Torah we-ha-ḥayyim*, Vol. 2 (Warsaw, 1899), pp. iii–viii.

[97] Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 378.

[98] Ibid., Vol. 1, pp. 339–40.

[99] For this information I am indebted to Judith Olszowy-Schlanger.

[100] Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 340.

[101] There is no conclusive evidence to establish their acquaintance; see M. D. Cassuto, *Danteh we-Immanuel ha-Romi* (Jerusalem: Mossad Bialik, 1966), pp. 7–18.

[102] See, e.g., G. Sermoneta, *Un glossario filosofico ebraico italiano del XIII secolo* (Rome: Edizioni dell'Ateneo, 1969). See also Vogelstein and Ringer, *Geschichte der Juden in Rom*, Vol. 1, p. 270.

[103] It was less frequent but not unheard of. See Cyril Aslanov, *Le provençal des Juifs et l'hébreu en Provence. Le dictionnaire Šaršot ha-kesef de Joseph Caspi* (Paris: Peeters, 2001). In his biblical commentary, Joseph Sniri used many vernacular words; see Judith Kogel, "Un commentaire biblique anonyme du treizième siècle, édition et analyse," Ph.D. dissertation, Université Sorbonne Nouvelle–Paris 3, 2007. For an additional bibliography, see George Jochnowitz and Paul Wexler, "Judeo-Provençal," at http://www.jewish-languages.org/judeo-provencal.html (accessed December 18, 2008).

[104] See in particular Carla Frova, "Écoles et universités en Italie (XIe-XIVe siècle)," in Heullant-Donat, ed., *Cultures italiennes*, pp. 53–85.

use of the vernacular in lay philosophy.[105] In Italy, different spheres of intellectual activity (e.g., poetry, politics, and philosophy) were often exercised by the same laypersons.[106] The Aristotelian knowledge that elsewhere in Europe was confined to the university was studied and discussed in various extra-university milieus, where the demarcation between clerics and others was not strict. The fact that culture, in particular philosophy and science, was not the exclusive domain of the clerics obviously lowered the barriers between Jewish and gentile intellectuals and created an open public space that facilitated Jews' access to non-Jewish culture in both the vernacular and in Latin: Dante and Immanuel's (possible) friendship is again symbolic, but the close relationship between Jacob ben Eliah of Montpellier and the two Venetian physicians who, he says, "considered me as a brother, and thought of me as a fellow citizen" also fits into this context.[107]

The familiarity with the vernacular as a cultural language also lowered the barriers to Latin. Jews were doubtless aware that the Italo-Romance dialects developed out of Latin, and it seems plausible that Latin did not have for them the aura of a specifically Christian liturgical and scholarly language that it had elsewhere. The fact that Latin was used by many lay intellectuals similarly helped rid Jews from the psychological blockage vis-à-vis Latin. Mastering Latin may thus not have been perceived as crossing boundaries and access to Latin scholarship was easier than it was in Provence. Furthermore, the long-standing southern tradition of multilingualism (see above) seems to have helped create cultural habits that made the learning of another "gentile" language more natural and less problematic than elsewhere. Many of the scholars who were acquainted with Christian learning lived in the Mezzogiorno at least for a while: Nathan of Rome, Hillel of Verona, and Shemariah ha-ʾIqriṭi (who knew Arabic, Greek, and Latin in addition to Hebrew) come to mind. A contributing factor was the absence of physical and intellectual proximity to an Arabophone Jewish culture. Provence benefited from close ties with Catalonia and, especially after 1148, from the influx of educated Arabic-speaking Jewish immigrants who, as noted, became instrumental in the Arabic-to-Hebrew cultural transfer. Moreover, some of these Arabophone newcomers started "dynasties" of scholars, whose expertise in Arabic was passed down from father to son over the course of several generations, creating a network of indigenous Arabophone families in Provence. It was also relatively easy to acquire manuscripts of Arabic works to be translated. In Italy, by contrast, the small influx of Arabophone scholars, mostly immigrants from al-Andalus or Provence, in the thirteenth century (notably Judah ben Solomon Ibn Matqah, Jacob Anaṭoli in the south, and Zeraḥyah ben Sheʾaltiel Ḥen in the north–center), did not found parallel lines of Arabophone scholars, so that no native Arabophone scholars and translators of Arabic were active there (Nathan ha-Meʾati and his sons seem to be the sole exception). Nor were manuscripts readily available. Thus, for example, when, in the early fourteenth century, Roman rabbis wanted to study Maimonides' commentary on the Mishnah in Hebrew translation, they could find neither the Arabic text nor translators in Italy and had to send emissaries to Spain.[108] The episode recounted by Immanuel of Rome, describing the thirst of Italian Jewish scholars for books translated from Arabic, illustrates their dependence on Provence in this respect.[109] It is possible that the absence of a steady local supply of Hebrew translations from Arabic favored a demand for translations from Latin. The access to texts and scholars was probably facilitated by the fact that, in the

[105] Ruedi Imbach, *Dante, la philosophie et les laics.* Initiations à la philosophie médiévale 1 (Paris: Éditions du Cerf and Fribourg: Éditions unversitaires Fribourg, Suisse, 1996).

[106] Coccia and Piron, "Poésie, sciences et politique."

[107] See n. 49.

[108] See, e.g., Vogelstein and Ringer, *Geschichte der Juden in Rom,* Vol. 1, pp. 419–21.

[109] See n. 54.

Italian peninsula, Jews lived in or near centers of learning (such as Rome), where Jewish scholars had relatively easy access to Christian carriers of knowledge.

A more general circumstance, already noted by Güdemann, should also be mentioned.[110] Animosity toward Jews tended to be low in Italy. In the decentralized Italian peninsula, Jews could migrate among the different republics to find the best possible living conditions. Another reason was economic: Unlike the situation in most other places, in northern Italy, because of its early economic development, Jews did not dominate moneylending, so that a main cause of anti-Jewish feeling did not exist there. In addition, the clergy in the Italian peninsula did not engage in anti-Judaic preaching, and if they did their propaganda fell on deaf ears (at least prior to the fifteenth century). The poets, too, did not fan anti-Jewish feelings.

In conclusion, it can be said that in both southern and central–northern Italy, the contacts between Jewish and gentile scholars were clearly closer and more intensive than those in the Midi, and this gave rise to a steady cultural transfer, notably in the form of Latin-to-Hebrew translations. These seem to be indisputable historical facts. To account for them, I argued that the "Italian exception" produced a "Jewish-Italian exception." In the south the Jewish–gentile interactions and the Latin-to-Hebrew translations were brought about by the multilingualism and the existence of patronage; in the center–north the crucial factors favoring cultural transfer were the place of laypersons in cultural life, the great share of the vernacular in cultural production, and the resulting open public sphere. The exceptional contexts in both the south and the north–center of Italy gave rise to a Jewish familiarity with gentile culture that is unmatched in the Midi or elsewhere in Europe, and it spurred the relatively great number of Latin-to-Hebrew translations.[111]

It should be emphasized again, however, that, their intrinsic importance for the history of ideas notwithstanding, Italian Jewish scholars' contacts with Latin culture and the Latin-to-Hebrew translations had a limited historical impact. The Jewish philosophical culture in the Italian peninsula essentially remained an offshoot of that in Provence, and both descended from Judeo-Arabic Jewish philosophy. A more significant Jewish engagement with the Latin Scholastic culture had to wait for fifteenth-century Christian Spain.

The Iberian Peninsula

Before the fifteenth century, virtually no Latin-to-Hebrew translations were done in the Iberian Peninsula. This is why Christian Spain has not entered my account so far. The fifteenth century, however, witnessed a radical change, with a sudden surge of translations, concentrated, as already noted, in philosophy (no fewer than twenty-seven translations; see Table 3.4 and comments). This unprecedented wave of assimilation of Latin philosophy is what Zonta has called the "Hebrew Scholasticism of the fifteenth century."[112] There is a manifest change in cultural *mentalité* here, with the end (at least in some circles) of the exclusive dependence on Arabic and the associated shunning of Latin philosophy. Concomitantly we witness an increasing familiarity with Christianity in Ḥasdai Crescas's circle.[113] What caused this new phenomenon? This cannot be discussed here, where our interest focuses on the twelfth through fourteenth centuries. Let me hazard the following suggestion only in passing. The existence of a growing stratum of *conversos* in the years following 1391, who often

[110] Güdemann, *Geschichte des Erziehungswesen und der Cultur der Juden in Italien während des Mittelalters*, pp. 1–8; Hebrew translation: *Ha-Torah we-ha-ḥayyim*, Vol. 2, pp. iii–viii.

[111] The reasons for the choices of works to be translated (mainly Albertine or Thomistic philosophy) deserve study.

[112] See n. 2.

[113] Lasker, "The Impact of Christianity on Late Iberian Jewish Philosophy."

remained in contact with their Jewish milieu, made the Jewish community a much more "porous" society, socially and intellectually, than it had been before.[114] The regular contacts between Jews and *conversos* and the resultant lowering of the boundaries between Jews and the majority culture may have helped kindle Jewish interest in Latin thought, even as it made it much easier for Jews to acquire the Latin language and learning. This created the social conditions that enabled the intellectual development that Zonta has characterized as follows: "The need to update Jewish philosophy by absorbing Scholastic doctrines and methods was felt not only for religious reasons [as in the case of Crescas and his circle], but apparently also for philosophical reasons, in order to allow Jewish philosophers to fully partake in the development of contemporary European thought."[115] The matter calls for further research.

AN AREA OF INTENSIVE LATIN-TO-HEBREW CULTURAL TRANSFER: MEDICINE

The appropriation of knowledge from Latin medical sources was unlike that in the other branches of the "foreign sciences." Latin-to-Hebrew translations of medical literature consistently represent the lion's share of all works translated from Latin: all eighteen translations in the twelfth century; seventeen out of twenty-nine (59 percent) in the thirteenth century; and sixty-two out of ninety-six (65 percent) in the fourteenth. Translation of medical treatises from Latin also began much earlier than of other fields, as we shall presently see. All this suggests that in medicine the attitudes toward the Latin language and Christian scholars were different than in other branches of science and created a different dynamic of translation as compared to science and philosophy.

The specific character of the medical translations from Latin stands out from its very first phase. It is striking to note that the first translations from Latin of medical works go back to as early as 1197–9, just at the end of Judah Ibn Tibbon's career, when an anonymous convert translated no fewer than twenty-four Latin medical books into Hebrew.[116] His translations are full of *leʿazim* that can be identified as Occitanian, indicating that he lived in the Midi.[117] This very educated and prolific person was a physician and on the cutting edge of progress: The collection of medical books he translated was exceptionally diverse and suggests that he was connected to a university, presumably (given that he resided in the Midi) that of Montpellier.[118] From the introduction to his *œuvres complètes*[119] and the poems he prefaced to some of his translations, we know that he came to repent his conversion. Possibly because he could not return to Judaism in public (which would expose him to the wrath of the ecclesiastical authorities), he published his translations under a *nom de plume:* Doʾeg ha-ʾEdomi. The name – that of an infamous biblical character, damned by Jewish tradition as a notorious villain – reflects the self-image of our anonymous translator.[120] Nevertheless, he

114 See Mark D. Meyerson, *A Jewish Renaissance in Fifteenth-Century Spain* (Princeton, NJ: Princeton University Press, 2005); Eleazar Gutwirth, "Widows, Artisans, and the Issues of Life: Hispano-Jewish Bourgeois Ideology," in Cooperman, ed., *In Iberia and Beyond: Hispanic Jews between Cultures*, pp. 143–73, on p. 149.

115 Zonta, *Hebrew Scholasticism in the Fifteenth Century*, p. 22.

116 Moritz Steinschneider, "Haqdamat ha-maʿatiq bi-khetav yad Paris 1190," in *Magazin für die Wissenschaft des Judenthums* 15 (1888), Hebrew section, pp. 6–14, and "Zur hebräischen Abtheilung," ibid., p. 197; idem, *HÜ*, Section 460, p. 713. See also my "The Father of the Translators from Latin into Hebrew. Doʾeg ha-Edomi and his 24 Translations (1197–1199)," forthcoming (in Hebrew). The discussion here is based on these studies.

117 Ron Barkai, *Les infortunes de Dinah* (Paris: Les Éditions du Cerf, 1991), pp. 125–6, 285–6; idem, *A History of Jewish Gynaecological Texts in the Middle Ages* (Leiden: Brill, 1998), p. 31. I am grateful to Cyril Aslanov for his help on this point

118 I am grateful to Michael McVaugh for his insights on this point.

119 List published by Moritz Steinschneider (see n. 116).

120 1 Sam. 21:8; 22:9, 18–20; Ps. 52. In the talmudic tradition, Doʾeg and Ahithophel are the consummate villains; see also Genesis Rabbah 32:7; J *Peah*, chapter 1 (16a). See also B *Sanhedrin* 93b, *Yevamot* 76b.

clearly wrote as a Jew for Jews in Hebrew. Steinschneider emphasized that Do'eg's Hebrew translations were the very first secular ones in Provence, predating Samuel Ibn Tibbon's translation of Aristotle's *Meteorology* (1210) by a decade.[121]

Several features of Do'eg's person, oeuvre, and social circumstances are salient. To begin with, Do'eg presumably learned Latin in connection with his baptism, reflecting the norm that, in Provence, Jews did not acquire Latin in a purely intellectual context. As for the motivation behind his translation project, Do'eg informs us that his decision to make a medical library available in Hebrew to his Jewish colleagues was prompted by his observation that many Jewish patients consulted gentile doctors and by his distress that they were prescribed remedies containing halakhically illicit ingredients and foodstuffs. The reason that Jewish patients flocked to Christian physicians seems to have been the recent introduction into Provence of Salernitan medicine and the concomitant rise (especially in the Midi) of medical practitioners with a university education.[122] This intellectually and socially new brand of medicine quickly became more prestigious than traditional medicine, and Jewish patients understandably were attracted to it no less than their Christian neighbors. As a repentant convert, Do'eg was probably also alarmed by the fact that for Jews to consult with gentile physicians and take the same medicines as Christian patients lowered the social barrier between them and Gentiles. Do'eg realized that Jewish patients would return to Jewish doctors only if the latter became modernized. In short, Do'eg was determined to help the Jewish medical system catch up with that of the Gentiles so that it could once again satisfy the needs of the Jewish population. The way to do this was to make a sizable corpus of the most up-to-date medical treatises available to Jewish physicians in Hebrew. Similarly, in the closing years of the fourteenth century, a few Jewish doctors, notably Leon Joseph of Carcassonne (1394), translated a number of the choicest advanced Latin medical treatises composed by the leading medical authorities at the University of Montpellier out of a feeling of inferiority vis-à-vis university-based medicine.[123]

The lesson of Do'eg's and Leon Joseph's cases can be generalized. In the medical sphere, we witness a specific kind of social interaction between Jews and their gentile environment. The human body is one and the same across religions and cultures: Human beings all suffer from the same maladies and all want to be cured ("If you prick us do we not bleed? . . . If you poison us do we not die?"). Patients will do whatever they can to get the best possible medical treatment, attaching at best secondary importance to the physician's religious affiliation (interdictions by clerical authorities of both faiths notwithstanding).[124] This unvarying datum of human nature inexorably puts the Jewish health system in constant direct contact and competition with its non-Jewish counterpart(s). Medieval Jewish physicians were thus under unceasing pressure from their patients to acquire the best available knowledge. This "best available knowledge" was not defined in scientific terms but rather in terms of the prestige of certain books or medical schools in lay opinion. We have to do here with the public sphere, in which it was not the prestige of a literary genre in faraway al-Andalus that

[121] *HÜ*, p. 713.

[122] Danielle Jacquart, *Le milieu médical en France du XII^e au XV^e siècle* (Geneva: Librairie Droz, 1981), esp. pp. 74, 259–62, 363, 394–6; Joseph Shatzmiller, *Jews, Medicine, and Medieval Society* (Berkeley: University of California Press, 1994), p. 2.

[123] Luis Garcia-Ballester, Lola Ferre, and Eduard Feliu, "Jewish Appreciation of Fourteenth-Century Scholastic Medicine," *Osiris*, 2nd series, 6 (1990); *Renaissance Medical Learning: Evolution of a Tradition*, pp. 85–117: repr. in Luis García-Ballester, *Medicine in a Multicultural Society: Christian, Jewish and Muslim Practitioners in the Spanish Kingdoms, 1222–1610* (Aldershot: Ashgate, 2001; Variorum Collected Series, No. 702), Essay IV.

[124] See: Monica H. Green and Daniel Lord Smail, "The Trial of Floreta d'Ays (1403): Jews, Christians, and Obstetrics in Later Medieval Marseille," *Journal of Medieval History* 34 (2008): 185–211; Noël Coulet, "Frontières incertaines: les juifs de Provence au Moyen-Âge," *Provence Historique* 35 (1985): 371–6, on p. 374.

counted, but rather the prestige of certain medical books among the local laity. The pursuit of health defined a single social field for gentiles and Jews alike, in which the two medical systems tended to function like connected vessels. To put it another way, in any given locale existed a single "interfaith" health-care system. This "medical common market" did not allow Jewish doctors to seclude themselves from the majority culture and its intellectual developments (as was the case in philosophy and science). Jewish and gentile doctors often interacted personally and frequently established collaboration and close personal contacts across religious differences. This was the case not only in Italy – where, given the lay public space, one would expect it – but also in the Midi.[125]

Jewish physicians in southern Europe were thus under continuous pressure (from patients) and stimulation (from confreres) to keep up with the advances of the medical system of the host society. Inasmuch as most Jewish physicians did not know Latin and used only Hebrew as their cultural language, this created a constant need for translations of the latest Latin medical treatises. The existence of this relentless demand for state-of-the-art medical translations explains both the early beginning of the translation of medical works (by Do'eg, for most of whose translations there was a constant demand over centuries) and their consistently high proportion of the total corpus translated from Latin in the twelfth to fourteenth centuries. We note in passing that Christian medical authorities were aware of this competition and that this awareness was probably one reason for their constant efforts to restrict interreligious medical relationships: They forbade Jews to treat Christians (and vice versa) as well as the sale of medical books to Jews.[126] Were it not for the latter prohibition, the number of Hebrew translations of Latin medical works might well have been higher.

Prior to the fifteenth century, then, medicine was the only discipline within Jewish culture that appropriated a significant body of Latin knowledge. The dynamics of cultural transfer in philosophy and science, on the one hand, and in medicine, on the other, are thus dissimilar: For several centuries Jewish philosophers could afford to preserve the cultural preferences of their Arabophone homeland in the Iberian Peninsula and remain in a Jewish *vase clos* without worrying too much about intellectual developments in the host society. By contrast, this host society relentlessly forced itself upon the Jewish physicians, who therefore could not lag far behind the contemporary gentile state of the art; the very object of medicine and its practical finality spurred a constant competition-*cum*-collaboration among physicians, which encouraged Jewish doctors to acquire the most recent and prestigious knowledge. The intensive communication between Jewish and gentile doctors is confirmed by the massive use of vernacular terms – the shared language of physicians, apothecaries, and patients – in much of the Hebrew medical literature.[127] Cultural transfer in medicine was definitely unlike that in other spheres of knowledge.

[125] See the rich information in Green and Smail, "The Trial of Floreta d'Ays (1403)."

[126] Shatzmiller, *Jews, Medicine, and Medieval Society*, pp. 90–9; idem, "Livres médicaux et éducation médicale: à propos d'un contrat de Marseille en 1316," *Medieval Studies* 42 (1980): 463–70, on p. 463.

[127] On this still-neglected subject, see G. Bos and G. Mensching, "Literature of Hebrew Medical Synonyms: Romance and Latin Terms and their Identification," *Aleph* 5 (2005): 169–211. There even exists a manuscript including a treatise on fevers in Old French, written in vocalized Hebrew letters (preserved in a unique manuscript: Staatsbibliothek zu Berlin-Preußischer Kulturbesitz, MS Or. oct. 512). Only recently has this tract begun to be studied. See Marc Kiwitt, *Der altfranzösische Fiebertraktat Fevres. Teiledition und sprachwissenschaftliche Untersuchung* (Würzburg: Königshausen und Neumann, 2001); Stefanie Zaun, "Fieberbehandlung im Mittelalter. Edition und Analyse eines altfranzösischen Textes in hebräischer Graphie," in Regina Schleicher and Almut Wilske, eds., *Konzepte der Nation: Eingrenzung, Ausgrenzung, Entgrenzung* (Bonn: Romanistischer Verlag, 2002), pp. 273–91; Julia Zwink, "Étude lexicographique du traité anonyme *Fevres*: Une compilation médicale en ancien français, écrite en caractères hébraïques," *Panace@–Boletin de Medecine y Traducción* 7(24) (2006): 250–60 (available online at www.medtrad.org/panacea.html; accessed December 22, 2008).

This account of the Jewish interaction with Latin medicine is consistent with the fact that the first dated Latin-to-Hebrew translations made in Provence after Doʾeg – about three-fourths of a century later – were also produced by physicians.[128] There are, first, the translations of medical books: Nicholas Praepositus's *Antidotarium*, translated by the physician Jacob ha-Qaṭan, and Roger's *Book of Oil and Water*, probably translated by the same hand.[129] More salient in the present context are the first datable Hebrew translations from Latin of nonmedical works made in Provence. These are the work of Solomon ben Moses Melguiri, who in the third quarter of the thirteenth century translated (and partially reworked) two Latin texts, the *Book of the Heavens and the World* and the *Book on Sleep and Wakefulness*, in addition to a medical text (*Circa instans* by Matthew Platearius).[130] Melguiri was a physician, so his knowledge of Latin is unexceptional and reflects the fact that physicians, who owed their knowledge of Latin to their professional needs, played a major role in the Latin-to-Hebrew cultural transfer, at least in the beginning.

The language of Jewish medicine remained Hebrew, as the translations themselves testify. Even where Jews passed university examinations in order to be licensed, they studied medicine in Hebrew (frequently within the family[131]), and they passed the oral examination in the vernacular.[132] As already noted, no cases are known of a Christian master with a Jewish student. We can thus identify the following pattern: The existence of a unique medical system for Jews and gentiles compelled the Jewish physicians to avail themselves of a body of medical knowledge that would be *comparable* to the Christian one; at the same time, the internal dynamics of Jewish culture made it desirable that this body of knowledge also be distinct from the Latin one and hence an *alternative* to it, so as to make it "Jewish" and help maintain the social barriers between Christians and Jews. The distinctiveness of the universalistic element in Jewish medicine – and culture in general – was asserted by maintaining Hebrew as the only cultural language.[133]

[128] Translations that cannot be dated with certainty or whose author is unknown will not be considered here, where our focus is historical. I have in mind notably the Hebrew translation of a section of the Old Latin translation of Aristotle's *De anima* and Dominicus Gundissalinus, *De anima*. See Teicher, "The Latin-Hebrew School of Translators," on pp. 403–16; M. Zonta, *La filosofia antica nel Medioevo ebraico* (Brescia: Paideia, 1996), pp. 193–5.

[129] *HÜ*, Section 508; S. Muntner, "R. Jacob ha-Qaṭan, the Anonymous Translator," *Tarbiz* 18 (1947): 192–9; *HÜ*, p. 831.

[130] See *HÜ*, p. 253; R. Glasner, "The Hebrew Version of *De celo et mundo* attributed to Ibn Sina," *Arabic Sciences and Philosophy* 6 (1996): 89–112, and *HÜ*, p. 284; Hagar Kahana-Smilansky, "*Aristotle on Sleep and Wakefulness*: A Medieval Hebrew Adaptation of an Unknown Latin Treatise," *Aleph* 10 (2010): 67–118 and *HÜ*, p. 822.

[131] Shatzmiller, *Jews, Medicine, and Medieval Society*, pp. 22–4; Bresc, *Arabes de langue, juifs de religion*, pp. 59–60.

[132] Shatzmiller, *Jews, Medicine, and Medieval Society*, p. 38.

[133] This statement can be generalized. Beginning with the second half of the twelfth century, Jews were confronted with distinctively philosophical arguments refuting Jewish positions. This philosophically grounded anti-Jewish polemics created a double need. On the one hand, Jewish intellectuals felt an urge to avail themselves of intellectual means that would allow them to confront challenges from the majority culture and sustain their side in religious polemics. On the other hand, Jewish intellectuals wished to preserve social and intellectual boundaries intact, so as to demarcate the Jewish community from the gentile society. The Jewish culture that resulted from this double pull can be characterized as both *comparable* and *alternative* to the majority culture: Inasmuch as its contents are concerned, the Jewish philosophical culture was *comparable* to its Latin counterpart, thereby making interaction with the majority culture possible; at the same time, it was also distinct from the latter so as to be an *alternative* to it. By developing a philosophical culture that was at once comparable and alternative to the Scholastic culture, Jews had at their disposal intellectual means that allowed them to guard the interreligious boundaries and affirm their distinctive identity vis-à-vis the host culture, while at the same time being able to respond to intellectual challenges issuing from it. This is the argument in my "Arabic into Hebrew: The Appropriation of Secular Knowledge in Twelfth-Century Provençal Judaism" (see n. 62).

CONCLUSION

I have focused on the marked dissimilarity of Jewish attitudes to Muslim-Arabic and to Christian-Latin bodies of knowledge as cultural resources. Let us recall that this problématique concerned only a minority of Jews at any time; for the majority (including men of letters), *all* non-Jewish lore was anathema, whether in Arabic or in Latin. The traditionalist camp formed a closed community whose borders were delineated by the authoritative texts of Judaism. Hence this study bears on cultural attitudes within a small segment of Jewish society only, comprising mainly scholars who followed Maimonides' dictum that one should "hear the truth from whoever says it" and rejected the spiritual autarky of Judaism. However, even this group usually preferred truths expressed in Arabic to truths formulated in Latin: European Jewish intellectuals evinced a strong reticence to Latin thought, although, as noted, this reserve was weaker in Italy than in Provence. Thus, even though the Christian culture was closer geographically, Jews perceived it as culturally more distant and alien than the Islamic-Arabic one. As a result, the Jewish scientific-philosophical culture consistently depended on works translated from Arabic (composed by Jews and non-Jews). Before the fifteenth century, inputs from Latin were rare and had a limited impact.

Things were very different in the medical sphere: Although Hebrew medicine initially depended on Arabic medicine, it soon began drawing on Latin medicine too. Medical works were translated from Latin into Hebrew early and in quantity. The reasons for this were both intellectual and social. The universal human equality in the face of illness and suffering created a "common market" of medical treatment, which made it difficult for Jewish physicians to remain closed to changes in the medical system of the host culture. Medical literature also had no theological relevance. A similar situation, albeit of more limited scope, obtained in astronomy.

As a result of the penchant for Arabic, Jewish philosophical culture as a whole lagged behind its time.[134] The scientific and philosophical works that were translated from Arabic were mostly centuries old. Many of them were classics, and perhaps they were translated as such. However, these works were now the relic of a bygone age, not part of a vivid culture responding to current needs. The concentration on Arabic texts simultaneously bespeaks the preference given to that culture over the Latin one and the intellectual isolation of Jewish philosophical thought. By contrast, the (relatively few) Jewish intellectuals in Italy who were in contact with the Christian majority culture more often than not assimilated up-to-date texts. The Latin works that Hillel of Verona and Judah Romano translated were mostly quite recent. Similarly, the medical works selected for translation from Latin as a rule contained cutting-edge medical knowledge (even if some had been written centuries earlier). The fifteenth-century translations of philosophical works in Spain seem to reflect at least in part the needs of Jewish scholars who were raised on the Hebrew philosophical tradition but (through their encounter with Latin scholastic philosophy) discovered that it was outdated and sought to catch up and complement their philosophical education.

The choice of Arabic as source language thus reflects at the same time the continued attachment to Arabic culture – itself a symptom of a cultural closure and isolation – and the disinclination toward the Christian-Latin culture. Where Jewish scholars did not connect to the contemporary Latin majority society, their intellectual energies and creativity were deployed in a *vas clos*, mostly out of touch with mainstream developments. R. Levi ben

[134] The following paragraph was inspired by remarks made by Prof. Carsten Wilke (Budapest) at the international workshop "Medieval Hebrew Philosophical Translations: Terminology, Methodology and Conceptual Frameworks" (see n. 9). I am grateful to Prof. Wilke for his insightful and helpful observations, but I am not sure that what I made of them exactly corresponds to his intentions.

Gershom (1288–1344), the immensely talented and original mind, is presumably the most pathetic example of the inconsequence of the creativity of an "isolated genius."[135]

I have not paid attention here to the handful of translations from the vernacular. Berekhiah ha-Naqdan, for example, who translated the *Questiones naturales* by Adelard of Bath from Latin to Hebrew under the title *Dodi we-nekhdi* (Uncle and Nephew), also translated a lapidary from Old French, as well as texts of *musar*.[136] We know too little of Berekhiah's biography to say anything certain about the historical conditions that led to this kind of cultural transfer.[137] Another phenomenon that I did not discuss here is that of Jewish scholars who participated in the Arabic-to-Latin transfer of knowledge: Although they show that Jewish and Christian scholars could work together as individuals (notably within a strong institutional framework supplied by a patron), these cases of collaboration seem to have had no impact on Jewish culture and therefore have no bearing on our subject.[138]

The bottom line is that the attitude of medieval Jews toward foreign knowledge varied as a function of the discipline in question and its bearers, the place, and the historical period. The textual corpus of medieval Jewish philosophy was shaped no less by sociology than it was by theology and epistemology.

[135] On Levi ben Gershom's originality, see my "Levi ben Gershom (Gersonides), 1288–1344," in S. H. Nasr and O. Leaman, eds., *The Routledge History of Islamic Philosophy* (London: Routledge, 1996), pp. 739–54; repr. in *Science in the Medieval Hebrew and Arabic Traditions*, Essay IV. On his intellectual isolation, see my "Gersonide, génie solitaire" (see n. 11).

[136] Hermann Gollancz, ed. and trans., *Dodi we-Nechdi (Uncle and Nephew): The Work of Berachya Hanakdan* (London: Oxford University Press, 1920); M. Steinschneider, "Lapidarien, ein culturgeschichtlicher Versuch," in *Semitic Studies: In Memory of Rev. Dr. Alexander Kohut* (Berlin, 1897; repr. Jerusalem: Makor, 1972), pp. 42–72, on p. 62; Hermann Gollancz, ed., *The Ethical Treatises of Berachya* (London: D. Nutt, 1902; repr. New York: Arno Press, 1973).

[137] The most recent discussion is to be found in Norman Golb, *The Jews in Medieval Normandy: A Social and Intellectual History* (Cambridge: Cambridge University Press, 1998), pp. 321–47. See also Gad Freudenthal, "The Introduction of Non-Rabbinic Learning into Provence in the Middle of the Twelfth Century: Two Sociological Patterns (Abraham Ibn Ezra and Judah Ibn Tibbon)," forthcoming in S. Stroumsa and H. Ben-Shammai, eds., *Exchange and Transmission Across Cultural Boundaries: Philosophy, Mysticism and Science in the Mediterranean World* (Jerusalem: Israel Academy of Science and Humanities).

[138] For a very useful overview of the Jewish involvement in these translations, see Mauro Zonta, "The Jewish Mediation in the Transmission of Arabo-Islamic Science and Philosophy to the Latin Middle Ages: Historical Overview and Perspectives of Research," in A. Speer and L. Wegener, eds., *Wissen über Grenzen. Arabisches Wissen und lateinisches Mittelalter* (Berlin: de Gruyter, 2006), pp. 89–105. See also Charles Burnett, "Arabic Philosophical Works Translated into Latin," in Robert Pasnau, ed. in association with Christina van Dyke, *The Cambridge History of Medieval Philosophy* (Cambridge: Cambridge University Press, 2010).

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The Production of Hebrew Scientific Books According to Dated Medieval Manuscripts

Malachi Beit-Arié

The most reliable and accurate way to unveil the extent of scientific scholarship and readership among the Jews, principally during the High Middle Ages, is to employ a material approach. The extant medieval Hebrew codices – all manuscripts written in Hebrew characters, regardless of the language – and their remains, of which there may be a hundred thousand, provide the only tangible and quantitative evidence of the elusive intellectual activities through time and space. Surveying all extant Hebrew manuscripts and isolating the scientific books can provide us with precise data on the production and use of scientific texts in the various Jewish geocultural areas over the centuries; however, even these data, although constituting the soundest feasible method for discovering the intellectual and social reality, cannot be regarded as ultimate. The surviving medieval codices represent only a small fraction of the Hebrew books produced during the Middle Ages. The random nature of survival and the unknown rate of survival in each area and period would make the data descriptive rather than definitive.

In any case, such an extensive survey would involve an enormous investment that is unfeasible at present, even if we eliminated the tens of thousands of fragments from the Cairo Geniza, in which there were few scientific works anyway. Although most of the manuscripts have been catalogued by the Institute of Microfilmed Hebrew Manuscripts at the Jewish National and University Library in Jerusalem and are available in a computerized catalogue, many of them lack accurate paleographical identification as to when and where they were written; others have not been textually identified.

Hence, I would suggest exploiting the precise and exhaustive, though limited, data provided by the corpus of all dated manuscripts in Hebrew script. The small number of explicitly dated Hebrew manuscripts, supplemented by datable (though undated) manuscripts that include an indication of the scribe's name – a total of five thousand or so – has made it possible to study and record the codicological and scribal features of almost all of them. The Hebrew Paleography Project in Jerusalem, sponsored by the Israel Academy of Sciences and Humanities (in collaboration with the Jewish National and University Library in Jerusalem) in cooperation with the Institut de Recherche et d'Histoire des Textes (Centre National de la Recherche Scientifique, Paris), has been carrying out this worldwide project in a thorough and systematic way since its inception in 1965; the fieldwork is nearly complete.[1]

[1] The following publications describe the project: Colette Sirat and Malachi Beit-Arié, *Manuscrits médiévaux en caractères hébraïques portant des indications de date jusqu'à 1540* (Paris: Centre National de la Recherche Scientifique; Jerusalem: Israel Academy of Sciences and Humanities, 1972–86), Parts 1–3; Colette Sirat, with Malachi Beit-Arié,

The Jerusalem branch of this project has assembled a detailed computer database, with all the quantitative codicological variables, many measurable codicological attributes – physical, technical, technological, graphic, scribal, textual, and parascriptural features – and digital images of selected pages of each manuscript. The database, SfarData, has a sophisticated retrieval system that supports elaborate data retrieval, quick sorting, and endless querying, linking, classification, clustering, and statistical and graphic presentations. SfarData thus supplies us with a precise tool for the typological characterization, historical study, and paleographical identification of undated manuscripts on the basis of common codicological parameters.[2]

Obviously, using this corpus considerably reduces the representative nature of the ratio of the scientific books in various areas and periods. It is, however, the only feasible research method. Moreover, the use of this reduced corpus is compensated for by the well-defined and exhaustive evidence, with known dates and places of copying. Employing the Hebrew codicological database to sketch out the dissemination and consumption of scientific books has a serious shortcoming, however. Because the main concern and innovation of the Hebrew Paleography Project was codicological, until recently the classification of texts was very laconic and confined to general subjects believed to affect the shape and configuration of the written space. Thus all scientific subjects, including mathematics, astronomy (as well as calendar calculations), and medicine, are shoehorned into a single topic in the database, namely, "the sciences."

I hope that, despite this drawback, historians of Jewish science will benefit from the limited and brief information that follows, especially with regard to the geographical and historical distribution of scientific books in general.

Scientific books constitute 9 percent of all the dated manuscripts studied.[3] When we break them down by geocultural region, we find that they accounted for 13 percent of the manuscripts in the Sephardi zone (Iberian Peninsula, Provence and Bas Languedoc, Sicily, and the Maghreb), 2 percent in the Ashkenazi zone (central and northern France and

Michel Dukan, et al., *Les papyrus écrits en caractères hébraïques* (Paris: Éditions du Centre National de la Recherche Scientifique, 1985); Malachi Beit-Arié, with Edna Engel and Ada Yardeni, *Specimens of Mediaeval Hebrew Scripts*, Vol. 1: *Oriental and Yemenite Script* (Jerusalem: Israel Academy of Sciences and Humanities, 1998); Malachi Beit-Arié and Edna Engel, *Specimens of Mediaeval Hebrew Scripts*, Vol. 2: *Sephardi Script* (Jerusalem: Israel Academy of Sciences and Humanities, 2002); Malachi Beit-Arié, Colette Sirat, and Mordechai Glatzer, *Codices hebraicis litteris exarati quo tempore scripti fuerint exhibentes*, Vols. 1–4, Monumenta Palaeographia Medii Aevi: Series Hebraica 1–4 (Turnhout: Brepols, 1997–2006).

2 For information on the database, see Malachi Beit-Arié, "La base de données codicologiques du 'Hebrew Palaeography Project': Un outil pour la localisation et la datation des manuscrits médiévaux hébreux," in J. Hamesse, ed., *Méthodologies informatiques et nouveaux horizons dans les recherches médiévales: Actes du colloque international de Saint-Paul-de-Vence 3–5 septembre 1990* (Turnhout: Brepols, 1992), pp. 17–67; idem, "The Codicological Data-Base of the Hebrew Palaeography Project: A Tool for Localizing and Dating Hebrew Medieval Manuscripts," in Diana Rowland Smith and Peter Shmuel Salinger, eds., *Hebrew Studies: Papers Presented at a Colloquium on Resources for Hebraica in Europe* (London: British Library, 1991), pp. 165–97 and updated in Malachi Beit-Arié, *The Makings of the Medieval Hebrew Book* (Jerusalem: Magnes Press, 1993), pp. 41–73; idem, "SFARDATA: The Henri Schiller Codicological Database of the Hebrew Palaeography Project, Jerusalem," *Gazette du Livre Médiéval* 25 (Autumn 1994): 24–9. Note that the database was originally installed on a mainframe; it was later converted into successive Dbase, FoxPro, Visual FoxPro, and lately SQL formats running on PCs. The most recent avatar of the system supports full integration of codicological, textual (including the full text of colophons), and numerical data along with images of selected pages for each paleographical unit.

3 The number of dated scientific manuscripts studied is 257. A larger corpus that also includes unstudied and unlocated dated manuscripts has 288 items. The corpus of all studied manuscripts including undated manuscripts with an indication of the scribe's name has 311 items. Including manuscripts that have not been studied (almost all of them undated) brings the total to 375. The geocultural and chronological distribution in the broader corpora hardly differs from that of the dated codices.

Germany), 11 percent in Italy, 15 percent in the Byzantine zone (Greece and the Greek islands, western Asia Minor, the Balkans, and the Crimea), 3 percent in the Near East, and 2 percent in Yemen (which constitutes an independent subcategory of the Near Eastern zone).

The meager representation of scientific manuscripts in Ashkenaz is expected, given the almost total lack of interest in the sciences there. The same may apply to the low proportion in the Near East, although one might expect to find more scientific books there, particularly in early periods. In contrast, the finding that the Byzantine zone ranks first in the diffusion of scientific books is surely unexpected. It supplements other hitherto unknown facts about the obscure and underestimated Jews of the Byzantine zone and entirely modifies their intellectual profile. Note, too, that the Byzantine zone also has the largest share of philosophical and kabbalistic works – 31 percent of all dated manuscripts. In one sense, scientific and philosophical texts can be grouped in the same intellectual enterprise. Such a subject group represents about half of the surviving dated Byzantine codices.

As for the chronological distribution, no dated scientific codex in Hebrew characters copied before the thirteenth century survives. Those copied in the thirteenth century are negligible. Consequently, the figures presented here relate only to the fourteenth and fifteenth centuries and the first four decades of the sixteenth century.[4] For the fourteenth century, the proportions of scientific manuscripts among all dated manuscripts are as follows: Sephardi zone, 14 percent; Italy, 9 percent; Byzantium, 3 percent; and the Near East, 3 percent. In the fifteenth century, the ratio of scientific books increased in all regions, but especially in the Byzantine zone: 17 percent in the Sephardi zone, 14 percent in Italy, 17 percent in the Byzantine zone, and 8 percent in the Near East. The data for the first decades of the sixteenth century are more limited, because the Sephardi zone no longer existed. In Italy, scientific books accounted for 8 percent of all manuscripts; in Byzantium, 23 percent.

Another social aspect of the production and use of scientific books that can be extracted from our codicological corpus and database relates to the identity of the copyists and the intended user of the copy. I do not mean the prosopographical identification of the scribes and original owners who commissioned the copying of scientific works. At this stage, very few can be identified in some way or another. Nevertheless, manuscripts with colophons can reveal information about the general social nature of the production of scientific books, which has significant consequences for their transmission. To present this aspect, I must preface some remarks pertaining to the singular character of Hebrew book production.[5]

Unlike the ecclesiastical and institutional framework in which most Latin and Greek (to some extent also Arabic) manuscripts were produced until the High Middle Ages, and unlike the production and dissemination of many Latin manuscripts by secular commercial ateliers in the Late Middle Ages, the production of Hebrew codices was never initiated by intellectual establishments. They were never copied in clerical, academic, or commercial centers,

[4] The Hebrew Paleography Project chose 1540 (corresponding to the Hebrew year 5300) as the terminal date of its study of medieval dated manuscripts, because it correlates more or less with the disappearance of the independent scribal tradition.

[5] See in detail M. Beit-Arié, "Transmission of Texts by Scribes and Copyists: Unconscious and Critical Interferences," *Bulletin of John Rylands University Library of Manchester* 75(3) (1993): 33–51; idem, "Publication and Reproduction of Literary Texts in Jewish Medieval Civilization: Jewish Scribality and its Impact on the Texts Transmitted," in Yaakov Elman and Israel Gershoni, eds., *Transmitting Jewish Traditions: Orality, Textuality, and Cultural Diffusion* (New Haven: Yale University Press, 2000), pp. 225–47; idem, "Were There Jewish 'Public' Libraries in the Middle Ages? The Individualistic Nature of the Hebrew Medieval Book Production and Consumption," *Zion* 65 (2000): 441–551 (in Hebrew); idem, *Unveiled Faces of Medieval Hebrew Books: The Evolution of Manuscript Production – Progression or Regression?* (Jerusalem: Magnes Press, 2003), pp. 14–16.

but as a private project; they were also privately owned and used. They were either commissioned from independent scribes or produced for the copyist's own use. The individualistic circumstances of Hebrew book production are attested by more than four thousand medieval colophons. Except for a few codices written for a community or a synagogue (but commissioned privately), all these manuscripts were private productions. Thirty-eight percent were copied by professional, semiprofessional, or even casual scribes commissioned by private individuals; the majority were copied over by learned readers or scholars for personal use. Though only 29 percent of the colophons state explicitly or implicitly that the manuscript was copied for personal use, it is most likely that the vast majority of colophoned manuscripts with no indication of their intended user (33 percent of all codices with colophons) were also user produced, because it is inconceivable that a hired scribe would fail to mention the person who commissioned the book in his colophon, but it is quite natural for a person copying for his own use to omit such information. Whereas the institutional and centralized character of Latin book production and dissemination enabled supervision of and control over the propagation of texts and the standardization of versions, no authoritative guidance or monitoring could have been involved in the private transmission of texts in Hebrew characters.[6]

Nevertheless, a distinction should be made between Hebrew texts copied by professional scribes and those copied by scholars and literati for their own use. The high frequency of copying for one's own use, which marks the history of the Hebrew book in both the West and East (excluding Yemen) and surely reflects the extent of literacy in Jewish society, had an immense effect on the transmission and versions of texts. Logic dictates that there was an essential difference between texts produced by hired scribes, who were uncritically more loyal to their models but also more vulnerable to the pitfalls of the copying process, and those copied critically by learned men for their own use. Indeed, reflective colophons by scholar-copyists attest to the freedom with which they interfered with the transmission of the text. They seem to have been confident that they were entitled, and even obliged, to improve the copied text by applying their own critical judgment.

Contrary to what one might expect, the high proportion of user-produced manuscripts and the critical copying of texts in Jewish society did not necessarily improve the transmission of literary works by eliminating scribal mistakes and restoring authentic versions; rather, they often engendered scholarly modifications, revisions, and re-creations of the copied text that often transformed or distorted the original. Although the copies made by hired penmen may have been corrupted by accumulated scribal errors, modern textual critics and editors can probably detect many of them by applying the philological methods of textual criticism. Versions created by learned copyists on the basis of several exemplars or scholarly conjecture, in contrast, inextricably jumble together separate channels of transmission or conflate different authorial stages of the text and are dominated by personal choices and judgments. Such versions present artificial and contaminated texts that mislead modern editors who attempt to classify and integrate them into the chain of transmission. In this respect, the damage inflicted on the text through sequential copying by professional scribes, vulnerable to the hazards of the copying process, is much easier to detect, and the authentic text is much easier to reconstruct than is the damage caused by scholarly "improvement" of user-produced books, which is often irreversible.

A classification of the dated scientific manuscripts studied according to their intended user reflects a tendency similar to that of the dated Hebrew manuscripts in general. However,

[6] In this respect, the social framework of Hebrew book production seems to be closer to that of the Islamic than of the Christian world, despite evidence of the institutional copying of books and large-scale commercialization of book production in the Arab world. See M. Beit-Arié, *Hebrew Manuscripts of East and West: Towards a Comparative Codicology* (London: The British Library, 1993), pp. 81–2, and the relevant notes on pp. 120–1.

the ratio between user-produced and commissioned scientific books is considerably higher. Of the 257 manuscripts in this category, 32 percent were produced by the owner himself,[7] and 23 percent were commissioned from hired scribes; the colophons of the other 45 percent do not specify for whom they were copied. If we are justified in assuming that a copy in which no intended user is named was probably not commissioned, then the proportion of user-produced copies is higher among scientific books than among other manuscripts and may have reached three-fourths of the total. This remarkable proportion may be explained by the scientific nature of the texts and the professional needs of the scholars and learned copyists. Historians of Hebrew science should bear this proportion in mind when preparing critical editions and be aware of the editorial proclivities of scholarly copyists.

Humble as these data are, they shed unexpected light on the demand for and readership of scientific literature and the intellectual interests of Jewish societies in the Middle Ages. Our approach deviates from the traditional method of the history of science, which is engaged in analysis of texts. This short presentation offers a shift in historical perspective and research, from a focus on texts and authors to one on the production and use of scientific books, whatever their content and scientific quality. A material study surely provides a more accurate reflection of the social status and reception of scientific works than a textual study does.

7 This includes several manuscripts copied by a son or a relative living in the owner's or intended user's household.

PART II

INDIVIDUAL SCIENCES AS STUDIED AND PRACTICED BY MEDIEVAL JEWS

5

Logic in Medieval Jewish Culture

Charles H. Manekin

> O simple ones, understand shrewdness.
>
> – Prov. 8:5
>
> I think that such shrewdness is perfected through studying the art of logic. . . . For [this art] directs the intellect towards the ways of [scientific] endeavor and speculation.
>
> – Gersonides, Commentary on Prov. 8:5

"Logic," to paraphrase the medievals, is an ambiguous term. Broadly speaking, it refers to the study, construction, and appraisal of argument, and in this sense it is similar to "reasoning." More specifically, "logic" refers to a body of doctrines stemming from the Greek logical tradition, and, even more specifically, to those doctrines found in the nine books of the medieval *Organon* (Porphyry's *Isagoge*; and Aristotle's *Categories*, *De interpretatione*, *Prior Analytics*, *Posterior Analytics*, *Topics*, *Sophistical Refutations*, *Rhetoric*, and *Poetics*).

A comprehensive survey of the place of logic in medieval Jewish intellectual life, in the broad sense of the term, would require nothing less than an analysis of the varieties of reasoning in the various disciplines studied by Jews, nonphilosophical as well as philosophical. Even the less ambitious task of tracing the influence of the Greek logic on medieval Jewish philosophy would call for a survey of the entire literature, because what philosophical work could be excluded? The present essay has more modest aims: first and foremost, to present a comprehensive survey of Jewish writings on logic in the Middle Ages; then, to make some general observations about the study of logic among medieval Jews; and, as an afterword, to sketch how some Jewish intellectuals applied the doctrines of logic to the fields of biblical exegesis and rabbinic jurisprudence.

LOGIC AND THE JEWS OF ISLAMIC COUNTRIES

Our evidence for the study of logic among Jewish intellectuals in the Islamic world is mostly indirect, through references to the study of logic in curricula, occasional remarks by contemporary historians writing in Arabic, and the presence of logical doctrines in texts of religious philosophy. Using these sources, one may safely assume that students who embarked upon a study of secular sciences for personal or professional reasons, and whose curriculum included the works of the Arabic Peripatetics (as the followers of Aristotle were known), devoted some of their time to logic, the *organon* or tool for science. According to the curriculum of Joseph ben Judah Ibn ʿAqnin (twelfth-century Morocco), logic should be studied after the traditional subjects of Torah, Mishnah, grammar, poetry, Talmud, and the defense of religion, but before the sciences, for which it is a "help and instrument." Ibn ʿAqnin actually inserts into his curriculum (and rearranges) a good deal of al-Fārābī's encyclopedic *Enumeration of the Sciences* to explain the various subjects.[1] Joseph himself was thirty before he began his studies in logic. By contrast, Judah ben Judah Ibn Abbas (thirteenth-century Spain) would have students begin their study of the sciences when they reached the age of eighteen, with medicine, mathematics, logic, astronomy, physics, and, finally, metaphysics. Ibn Abbas recommends that the student study first the logical books of Aristotle and then learn by heart, if he so desires, the rules of logic according to the compositions of al-Fārābī and Averroes.[2]

Texts on logic composed by Jews in the Islamic world are virtually nonexistent, with the notable exception of the *Maqālah fi-l-sinaʿat al-manṭiq* (Treatise on the Art of Logic) traditionally attributed to Maimonides, which we shall subsequently consider. There are treatments of Avicennan logic in the *Muʿtabar* of Abu-l-Barakāt al Baghdādī (flourished in the mid-twelfth century) and in the *Jadīd fī-l-ḥikma* (New Wisdom) of the Baghdad philosopher Saʿad Ibn Mansūr Ibn Kammūna (d. 1284); the latter places great emphasis on intuition (*ḥads*) as a means of acquiring knowledge.[3] In his encyclopedic commentary on al-Suhrawardi's *Talwihāt*, Ibn Kammūna discusses, inter alia, the legitimacy of the fourth figure of the syllogism, an important subject in Arabic-speaking lands.[4]

As for earlier Jewish logicians in the Muslim West, the jurist Sāʿid Ibn Aḥmad of Andalus (d. 1070), in his *Categories of the Nations*, mentions five who distinguished themselves in logic: Isaac Israeli (d. 932); Menaḥem Ibn Fawwal of Saragossa, who wrote a book in question-and-answer form that included a summary of the principles of logic and physics; the grammarian Marwān Ibn Janāḥ; the grammarian Isaac Ibn Kasṭar of Toledo (d. ca. 1057/8; identified by Steinschneider with Isaac Ibn Yashush); and Solomon Ibn Gabirol of Saragossa (d. 1058), who was "very fond of the subject of logic," according to Sāʿid.[5] None of these writers has left behind works on logic. Joseph ben Jacob Ibn Ṣaddik, in his *ʿOlam qaṭan* (Microcosm), refers to a work on logic he composed, *Al-ʿUyūn wa-l-mudhāqarāt* (Speculations and Rememberings); it too is lost.

Despite the remarks by Sāʿid, neither Isaac Israeli nor Solomon Ibn Gabirol devotes much space to logic per se in his extant writings. Ten of Israeli's fifty-four philosophical definitions and descriptions in his *Book of Definitions* have to do with logic, although his definition of syllogism as "referring the cause to the caused" stems from the mutakallimūn rather than from the philosophers (whose definition he imputes, somewhat oddly, to the "dialecticians").[6]

[1] For a correlation of the Arabic text of Ibn ʿAqnin published by Moritz Güdemann, i.e., *Das jüdische Unterrichtswesen während der spanisch-arabischen Periode* (Vienna: C. Gerold'sohn, 1873), pp. 43–138 (in German) and 1–57 (in Hebrew), with that of al-Fārābī, see Mauro Zonta, "L'*Iḥṣā' al-ʿulūm* in ambiente Ebraico. 1. Il *Ṭabb al nufūs* di Ibn ʿAqnīn," *Henoch* 12 (1990): 53–75. (Zonta skips from p. 21 to p. 26 in Güdemann; in fact, the material on these pages corresponds to the earlier section on the "Parts of Logic.") Steinschneider first pointed out the dependence of this section on al-Fārābī's "Enzyklopädie" in *Hebräische Bibliographie* 14 (1874): 38.

[2] *Ya'ir nativ*, chapter 15, in Güdemann, *Das jüdische Unterrichtswesen*, pp. 152–83 (in German) and 58–62 (in Hebrew). The relative position of mathematics and logic in some of these curricula is not consistent. See Charles H. Manekin, *The Logic of Gersonides* (Dordrecht: Kluwer, 1992), p. 8.

[3] See Y. Tzvi Langermann, "Ibn Kammūna and the 'New Wisdom,'" *Arabic Sciences and Philosophy* 15 (2005): 277–327.

[4] Y. Tzvi Langermann, "Ibn Kammūna (d. 1284)," in the *Routledge Encyclopedia of Philosophy* (London: Routledge, 1998), Vol. 4, pp. 621–3.

[5] Semaʿan I. Salem and Alok Kumar, trans. and eds., *Science in the Medieval World: Book of the Categories of Nations by Ṣāʿid al-Andalusī* (Austin: University of Texas Press, 1991), pp. 79–82.

[6] See Alexander Altmann and Samuel Stern, *Isaac Israeli: A Neoplatonic Philosopher of the Early Tenth Century* (Oxford: Clarendon Press, 1958), p. 57. Stern points out that Saadia, according to Qirqisānī, distinguishes the definition of the syllogism of the logicians from that of the dialecticians. How much did Saadia know about the syllogism? The term *qiyās*, understood as syllogism, does not appear in *Beliefs and Convictions*.

Solomon Ibn Gabirol's *Source of Life* is one of the most rigorously argued texts of medieval philosophy written by a Jew. The doctrine of the categories plays a large role in his system, but his penchant for constructing numerous demonstrations out of polysyllogisms was mocked by his contemporary, Abraham Ibn Daud (d. 1180), who suggested that their number was intended to compensate for their weakness. The Aristotelian Ibn Daud criticizes Ibn Gabirol's demonstrations for being based on "imaginary" and "dubious" premises, rather than as invalid.[7] In a similar vein, the Aristotelian Maimonides criticizes the theological demonstrations of the Kalām because they rest on false or dubious premises, not because their premises fail to imply their conclusions.[8] Maimonides says that the Kalām demonstrations are conclusive only for those who cannot distinguish among demonstration, dialectics, and sophistical arguments;[9] on Aristotelian principles, if they rest on at least one false premise, then they are sophistical.[10] The Aristotelians were suspicious of putative demonstrations whose premises were not rooted in solid empirical ground.

Like their Muslim counterparts, Jews learned Aristotelian logic from the Arabic translations of Aristotle and the commentaries by the Arab Peripatetics. We have Maimonides' oft-quoted advice to his Hebrew translator Samuel Ibn Tibbon, "You should occupy yourself with no other works in logic than those composed by the sage Abū Naṣr al-Fārābī." In Maimonides' letter to his student Joseph ben Judah Ibn Simeon, prefaced to the *Guide of the Perplexed*, we are informed that Joseph read texts in logic before Maimonides; it is reasonable to assume that these texts included some of al-Fārābī's commentaries on logic. This reliance upon al-Fārābī no doubt reflected the general sentiment among twelfth-century Jewish intellectuals in the Muslim West. We shall see in the paragraphs that follow that the earliest logical texts translated from Arabic into Hebrew, in Spain or Provence, were al-Fārābī's short treatises on the books of the *Organon*. Maimonides' younger contemporary, Abraham Ibn Daud, begins his *Exalted Faith* with a chapter on substance and accident, including the nine categories, which is largely based on al-Fārābī's writings on the *Categories*.[11] Joseph Ibn Ṣaddik's *ʿOlam qaṭan* begins with the distinction between the types of premises based on their *materia*, some of which seems to derive from al-Fārābī's short treatise on the *Topics*.[12] A statement attributed to al-Fārābī later in the *Guide* probably refers to the Long Commentary on the *Topics* that is no longer extant, although, as we shall see, excerpts were translated into Hebrew by Ṭodros Ṭodrosi in the fourteenth century.[13] Finally, in the *Medical Aphorisms*

7 *ʾEmunah ramah*, ed. Simson Weil (Berlin: Louis Lamm, 1919), pp. 2–3.

8 The exception is the Kalām's first method for demonstrating the creation of the world, which reasons inductively from a particular body to every body. Here, the argument is invalid rather than unsound. Note, however, that Maimonides says that it rests on the principle that "whatever rule may be found with regard to one particular body must necessarily be applied to every body." Interpreted in this manner, the argument falters because of a false assumption.

9 See Moses Maimonides, *The Guide of the Perplexed*, trans. Shlomo Pines (Chicago: University of Chicago Press, 1963), Part I, chapter 71, p. 180.

10 See *Guide* Part II, chapter 16 (trans. Pines, p. 293). Cf. Deborah Black, *Logic and Aristotle's "Rhetoric" and "Poetics" in Medieval Arabic Philosophy* (Leiden: Brill, 1990), pp. 94–6.

11 See T. A. M. Fontaine, *In Defense of Judaism: Abraham Ibn Daud* (Assen: Van Gorcum, 1990), pp. 16–20. For Ibn Daud's reference to al-Fārābī's short treatise on the *Topics*, see Moritz Steinschneider, *Alfarabi* (St. Petersburg, 1869), pp. 53–4.

12 Ibn Ṣaddik's view, given in *ʿOlam qaṭan*, ed. S. Horovitz (Breslau, 1903), p. 7, that primary intelligibles (*muskalot riʾšonot*) are among the commonly accepted premises (*mefursamot*), may stem from al-Fārābī's position, in the *Short Treatise*, that at the outset of our investigations, we do not distinguish between *muskalot riʾšonot* and *mefursamot*, because both are widely accepted. See G. Vajda, "Autour de la théorie de la connaissance chez Saadia: Al-Fārābī sur la valeur de la connaissance dialectique," *Revue des études juives* 126 (1967): 375–97.

13 *Guide* Part II, chapter 15 (trans. Pines, p. 293). G. Vajda suggested a passage from al-Fārābī's short treatise on the *Topics* as a possible source for some of the views attributed to him by Maimonides. See "À propos d'une citation non identifiée d' al-Fārābī dans le 'Guide des Egarés,'" *Journal asiatique* 253 (1965): 43–50. Cf. al-Fārābī,

Maimonides cites a passage probably from a part of al-Fārābī's Long Commentary on the *Prior Analytics* that is no longer extant.[14]

From the same letter, we learn that before Joseph came to Maimonides, he had studied, with another master, the doctrines of the mutakallimūn concerning "divine matters"[15] and that he now wished to learn whether the methods of the Kalām were demonstrative and, if not, to what art they belonged.[16] This suggests that in Jewish culture, as in Muslim culture, the study of logic was part of the curriculum of those intellectuals influenced by the *falsafa*. Other Jewish intellectuals, although employing terminology and doctrines that are traceable to Greek logic, show little sign of having devoted much study to the actual works of the *Organon*. This does not mean that their own writings were devoid of logic or of theoretical speculation concerning the conditions of valid argument. One need only think of Saadia Gaon's *Book of Beliefs and Convictions*, written two and a half centuries before the *Guide*; its introduction is devoted to such epistemological and logical issues as the causes of error, rules that are conducive to truth and to certainty, inferences from effect to a cause, ways of ensuring that an inference is necessary, and so on. Saadia's book is strongly influenced by the early Kalām, some of whose logical vocabulary and argumentative practices have been traced to Stoic sources.[17] This, too, is logic, though not of the Aristotelian variety, and would not be considered logic (*manṭiq*) by the Muslim Aristotelians.

This brings us to the *Maqāla fī sināʾat al-manṭiq* (Treatise on the Art of Logic), a small book of definitions of logical terms commonly attributed to Maimonides.[18] The attribution was challenged in the nineteenth century by Jacob Reifman and recently by Herbert A. Davidson;[19] one of the two manuscripts in Arabic characters attributes the work to the otherwise unknown "Jacob Abū Isḥaq ben Joseph the Israelite."[20] If the work is by Maimonides, who never refers to it in any of his writings, then it is not clear at what stage of his life he wrote it.[21] There is manuscript and textual evidence that the work was written at the request of a Muslim who wished to have an explanation of logical terms; judging from the contents, the intended audience is Muslim. Its importance lies not in its originality – its main source is al-Fārābī – but in its influence and impact on subsequent generations of Jewish intellectuals,

Kitāb al-Jādāl, in *al-Manṭiq ʿinda al-Fārābī*, ed. R. al-ʿAjam, 3 vols. (Beirut, 1985–6), Vol. 3, pp. 80–1. But Vajda does not claim that the passage he cites from al-Fārābī's short treatise is Maimonides' source, and as he points out (p. 46), Farabi's disdainful comment toward Galen is missing from the short treatise. That would be more appropriate for his Long Commentary.

[14] See Steinschneider, *Alfarabi*, p. 232; also see n. 17, this chapter. The passage does not appear in the edition of the *Sharḥ al-Qiyās* published in *al-Manṭiqiyyāt li-l-Fārābī*, ed. Muhammad Taqi Danishpazuh (Qumm, 1988), 2:261–553.

[15] Pines has "metaphysics," but the context suggests the theological part of metaphysics.

[16] *Guide*, "Epistle Dedicatory" (trans. Pines, pp. 3–4).

[17] See Joseph Van Ess, "The Logical Structure of Islamic Theology," in G. E. von Grunebaum, ed., *Logic in Classical Islamic Culture* (Wiesbaden: Otto Harrassowitz, 1970), pp. 21–50.

[18] See the edition by Israel Efros in "Maimonides' Arabic Treatise on Logic," *Proceedings of the American Academy of Jewish Research* 34 (1966), Hebrew section, pp. 9–42.

[19] J. Reifman, "Prozdor," in *Oṣar Ṭov* (1884), pp. 18–21; Herbert A. Davidson, "The Authenticity of Works Attributed to Maimonides," in Ezra Fleischer, ed., *Meʿah Sheʿarim: Studies in Medieval Spiritual Life in Memory of Isadore Twersky* (Jerusalem: Magnes Press, 2001), pp. 111–35; Herbert A. Davidson, *Moses Maimonides: The Man and His Works* (Oxford: Oxford University Press, 2005), pp. 313–22. For a defense of the attribution, see Ahmad Hasnawi, "Réflexions sur la terminologie logique de Maïmonide et son contexte Fārābīen: le *Guide des perplexes* et le *Traité de logique*," in Tony Lévy and Roshdi Rashed, eds., *Maïmonide: Philosophe et Savant* (Louvain: Peeters, 2004), pp. 39–79.

[20] See Davidson, *Moses Maimonides*, p. 316; Hasnawi, "Réflexions," pp. 64–76.

[21] The early dating was accepted by Derenbourg and Steinschneider (Davidson, *Moses Maimonides*, p. 318). Davidson, p. 319, suggests that were Maimonides the author, it would make sense to date the work from his later period, when al-Qāḍī al-Fāḍil, Saladin's vizier, was his patron. A new argument in favor of the attribution is put forward in Sarah Stroumsa, *Maimonides and His World* (Princeton, NJ: Princeton University Press, 2009), pp. 126–8.

who believed it to be by Maimonides. We shall subsequently consider the Hebrew translations of the work.

Whether Maimonides wrote the *Maqāla* or not, his own work shows the strong impact of Aristotelian logic, especially the *Guide of the Perplexed.* His conscious use of dialectical argumentation on behalf of the doctrines of creation ex nihilo and divine providence, his insistence on the nondemonstrability of the eternity or createdness of the world, his logical treatment of the Kalām problem of divine attributes, and, above all, his use of the Aristotelian theory of the signification of terms in his explanation of rabbinic and biblical language about God: These all testify to the importance of logic as an instrument for wisdom[22] (though not as a substitute for it; in the famous parable of *Guide* Part III, chapter 51, the logicians and mathematicians who lack knowledge of the sciences walk around the palace in search of the gate but cannot enter). Maimonides uses logical terminology and refers to logical doctrines in his legal and medical writings as well.[23]

In short, Jews in Arab lands who studied sciences and philosophy often began their study with logic, but they generally did not produce their own compositions in that discipline or, for that matter, in nonreligious philosophy. For them, the works of Aristotle, with the commentaries and compendia of the Arabic Peripatetics, sufficed, at least from the eleventh century onward. Some of these commentaries and compendia continued to be studied in translation among the Hebrew-reading Jews of Christian lands. As we shall see, however, they were supplemented by works of Scholastic logic, as well as by original compositions and commentaries by Jews, for reasons we shall examine presently.

ARABIC LOGIC IN HEBREW GARB

Thirteenth Century

It has been suggested that Maimonides' strong recommendation of al-Fārābī's logic to Samuel Ibn Tibbon may have been partly responsible for the profusion of Farabian texts on logic translated into Hebrew during the thirteenth and fourteenth centuries, as well as the large number of extant manuscripts.[24] Although this is certainly plausible, there is evidence that the process of translating al-Fārābī's logic into Hebrew had begun before the thirteenth

[22] For additional logical doctrines in the *Guide* and possible sources, see the article by Hasnawi cited earlier in n. 19.

[23] See, for example, the introduction to the *Commentary on the Mishnah*, ed. I. Shailat (Jerusalem: Maʿaliyot, 1995), p. 348, for his defense of the mishnaic practice of using the same name for an order and a tractate, because, according to the logicians, the species may be called by the name of its genus; for the latter point, see "Al-Fārābī's Short Treatise on the *Isagoge*," ed. D. M. Dunlop, *Islamic Quarterly* 3 (1956): 117–38, on pp. 128–9 (in English), 119–20 (in Arabic), et passim. See also Maimonides' remark in the *Book of Commandments*, ed. J. Kafiḥ (Jerusalem: Mossad ha-Rav Kook, 1971), p. 26, that, according to the logicians, there is no word in Arabic that signifies both command and prohibition; this appears to be taken word for word from al-Fārābī's *Short Treatise on the De Interpretatione*, ed. W. Kutsch and S. Marrow (Beirut: Imprimerie Catholique, 1960), pp. 46–7. I am indebted to Bernard Septimus for pointing this out to me. (It is also mentioned in Davidson, *Moses Maimonides*, p. 98 n. 124 and p. 114.) In contrast, Maimonides may not always be using logical terms in their technical sense; see, for example, his reference (*Commentary on the Mishnah*, ed. Shailat, p. 328) to the hermeneutical rules of R. Ishmael as *maqāyis jaddalīya*, which could mean "dialectical syllogisms" but probably means "disputatious reasonings"; for a defense of the former rendering, see Aviram Ravitzky, "Halakhic Arguments as Dialectical Arguments and Hermeneutical Principles as Aristotelian *Topoi* in Maimonides' Philosophy," *Tarbiz* 73 (2004): 197–224 (in Hebrew). Either way, *maqāyis jaddalīya* are not conclusive proofs. For an analysis of his remarks on syllogisms with mixed modal premises in the *Medical Aphorisms*, see Shalom Rosenberg and Charles H. Manekin, "Philosophical Observations on Maimonides' Critique of Galen," *Koroth* 9 (1989): 246–54 (in Hebrew).

[24] See Steven Harvey, "Did Maimonides' Letter to Samuel Ibn Tibbon Determine Which Philosophers Would Be Studied by Later Jewish Thinkers?" *Jewish Quarterly Review* n.s. 83 (1992): 51–70, on pp. 55–6.

century. At the end of Moses Ibn Tibbon's translation of al-Fārābī's *Kitāb al-qiyās al-ṣaghīr* (Short Book of the Syllogism), the translator writes (1255) this:

I translated the Epitome of the Syllogism from Arabic to Hebrew, I, Moses son of Samuel Ibn Tibbon from Granada, of blessed memory, and the translation was completed in the year five thousand and fifteen from the creation [1255]. I bestirred myself to translate it because I found that my wise grandfather (*zeqeni he-ḥakam*) had translated the next book of the treatise by Abu Nasr al-Fārābī after this one.[25]

"The next book" is apparently al-Fārābī's *Sharāʿiṭ al-yaqīn* (Conditions of Certainty): the *Maʾamar bi-tenaʾei ha-heqqeš ha-mofeti u-tenaʾei ha-ʾemet* (Treatise on the Conditions of the Demonstrative Syllogism and the Conditions of Truth). This is very short and may, despite Steinschneider's doubts,[26] have been translated by Judah Ibn Tibbon; the *Kitāb al-burhān* attributed to al-Fārābī appears to be too long and technical for Judah. Another indication of a twelfth-century translation is the tirade by an anonymous translator that appears in some of the manuscripts before the *Sophistics*, which decries the practices of other translators in his region. As Zonta has pointed out, some of the tirade is reminiscent of points made by Judah Ibn Tibbon in his introduction to his translation of the *Duties of the Heart*, and the region described appears to be Spain.[27] If this outburst was emitted by the translator of the *Sophistics*, then the work may stem from Spain in the late twelfth century. The manuscripts of the Hebrew translations of al-Fārābī's logical writings are marked by terminological variations that are indicative of revisions of existing older translations rather than independent translations, as Steinschneider asserted.[28]

In any event, most of al-Fārābī's extant writings on logic were translated into Hebrew by the end of the thirteenth century and appear to have had a significant impact on Jewish intellectuals of the time. The translated writings can be divided into three categories: (1) introductory works that have sections on logic (the *Iḥṣāʾ al-ʿulūm* or Enumeration of the Sciences and the *Mā yanbaghī an yuqaddama qabla taʾallum falsafat Aristū* or Prolegomenon to the Study of Aristotle's Philosophy), (2) introductory essays to the study of logic (*Risāla ṣuddira bihā-al-kitāb* or *al-Tawṭiʾah* or Introductory Epistle on Logic, and *Fusūl…fī ṣināʿat al-manṭiq* or Chapters in the Art of Logic), and (3) short treatises on individual books of the *Organon*, some of which may have been intended to form one complete work[29] (*Isagoge, Categories, De interpretatione, Prior Analytics*, both the *Kitāb al madkhal ilāʾ l-qiyās* or Book of the Introduction to the Syllogism and the *Kitāb al-qiyās al-ṣaghīr*, the *Sharāʿiṭ al-yaqīn* or Conditions of Certainty already mentioned, *Sophistics, Topics, Rhetoric*, and *Poetics*). There is evidence for a Hebrew translation of the Long Commentary on the *De interpretatione*: Excerpts from the Long Commentary on the *Topics* were translated by Ṭodros Ṭodrosi,[30] fragments of the Long Commentary on *Prior Analytics* are preserved in Averroes' *Logical Questions* and in the last chapter of Maimonides' *Medical Aphorisms*,[31] and some fragments of the Long

[25] MS Paris, BNF Héb. 917, f. 210.

[26] "Jehuda hat schwerlich schon eine solche Schrift übersetzt." See Moritz Steinschneider, *Die hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin: Kommisionsverlag des Bibliographischen Bureaus in Berlin, 1893; henceforth, *HÜb*), p. 47.

[27] See Mauro Zonta, *La filosofia antica nel Medioevo ebraico* (Brescia: Paideia, 1996), pp. 189–93.

[28] *HÜb*, pp. 43–8. A comprehensive analysis of these translations is a scholarly desideratum; Zonta, *La filosofia*, p. 190, considers his conclusions to be provisional.

[29] See Dimitri Gutas, "Aspects of Literary Form and Genre in Arabic Logical Works," in Charles Burnett, ed., *Glosses and Commentaries on Aristotelian Logical Texts: The Syriac, Arabic and Medieval Latin Traditions* (London: Warburg Institute, 1993), pp. 29–76.

[30] See Mauro Zonta, "Al-Fārābī's Commentaries on Aristotelian Logic: New Discoveries," in U. Vermeulen and D. De Smet, eds., *Philosophy and Arts in the Islamic World* (Louvain: Peeters, 1998), pp. 219–33.

[31] Steinschneider, "Alfarabi," pp. 31–43.

Commentary on the *Categories* are preserved in the commentary by Judah ben Isaac ben Moses Cohen on Averroes' Middle Commentary on the *Categories*.[32] The Hebrew translations of al-Fārābī's logical writings are extant in a significant number of copies, especially the encyclopedic *Enumeration of the Sciences*, the incomplete Hebrew translation of the short treatise on the *Topics* (the *Kitāb al-Jaddāl*, not the *Kitāb al-Taḥlīl*) and the *Sophistics*; there are more surviving copies of the last two works than of the corresponding commentaries of Averroes. In some manuscripts of Averroes' Middle Commentary on the *Organon*, we find that one of al-Fārābī's two short treatises on the syllogism replaces Averroes' difficult Middle Commentary.

Most of the translations of al-Fārābī's logical writings are anonymous and deviate from the translation terminology of the Tibbonids, which suggests an early date for them. The known translators are Moses Ibn Lajis (*Chapters on Logic*),[33] who also wrote a short summary of logical opposition, extant in a single manuscript;[34] Solomon Ibn Ayyub (mid-thirteenth century), an extract of chapter 4 preserved in the *Ḥotam tok̲nit* of his contemporary Abraham Bedersi;[35] Moses Ibn Tibbon (*Short Book of the Syllogism*) in 1255, a year before he translated the *Maqāla fī ṣināʿat al-manṭiq* as *Millot ha-higgayon* (henceforth called *Logical Terms*); Shem Ṭov ben Joseph Falaquera (*The Enumeration of the Sciences*) in his *Reʾšit ḥok̲mah* (1280s); and Qalonymos ben Qalonymos (also *The Enumeration of the Sciences*, 1314). Qalonymos ben Qalonymos may have translated another work attributed to al-Fārābī, namely the *Order of the Naming of the Sciences*, also known as the*Prolegomena to the Study of Aristotle's Philosophy*.[36]

Two short works in Hebrew that show the clear influence of Farabian logic were instrumental in disseminating al-Fārābī's ideas in the thirteenth century: Samuel Ibn Tibbon's *Peruš ha-millot ha-zarot* (Glossary of Unusual Terms),[37] appended to his revised translation of the *Guide* (1213), and the aforementioned *Logical Terms*.[38] Both belong to the philosophical genre of books of definition; both were important ancillary texts for beginning students of philosophy and science in Hebrew from the thirteenth century until well into the nineteenth (and in some quarters, perhaps, even today). The *Glossary* includes several extended definitions of terms in logic, including the five predicables, the ten categories, kinds of statements, and terms. Samuel's main source appears to be al-Fārābī; entire paragraphs are lifted

[32] See Mauro Zonta, "Al-Fārābī's *Long Commentary* on Aristotle's *Categoriae* in Hebrew: A Critical Edition and English Translation of the Newly-found Extant Fragments," in Binyamin Abrahamov, ed., *Studies in Arabic and Islamic Culture II* (Ramat Gan: Bar-Ilan University Press, 2006), pp. 185–254. For evidence that the Long Commentary on the *De interpretatione* was known to Gersonides, see Charles H. Manekin, "Preliminary Observations on Gersonides' Logical Writings," *Proceedings of the American Academy of Jewish Research* 52 (1983): 85–113, on p. 98 n. 41; Ruth Glasner, "On Gersonides' Knowledge of Languages," *Aleph* 2 (2002): 235–57, on pp. 252–4.

[33] See Harry Blumberg, "Alfarabi's Five Chapters on Logic," *Proceedings of the American Academy of Jewish Research* 6 (1934/5): 115–22.

[34] MS Florence, Biblioteca Medicea Laurentiana Or. 493, ff. 104b–105a.

[35] Ed. Polak (Amsterdam: I. Levisson firma D. Proofs Jr., 1865), pp. 246–7.

[36] See Mauro Zonta, *La "Classificazione delle Scienze" di Al-Fārābī nella Tradizione Ebraica, edizione critica e traduzione annotata della versione ebraica di Qalonymos ben Qalonymos ben Meʾir* (Turin: Silvio Zamorani, 1992). Cf. idem, "L'*Iḥṣāʾ al-ʿulūm* in ambiente Ebraico. 1. *Il Ṭibb al Nufūs* di Ibn ʿAqnīn," *Henoch* 12 (1990): 53–75.

[37] Samuel Ibn Tibbon, *Peruš ha-millot ha-zarot,* ed. Y. Even-Shmuel (Jerusalem: Mossad ha-Rav Kook, 1946); repr. as an appendix in Maimonides, *Moreh nevuk̲im,* ed. Y. Even-Shmuel (Jerusalem: Mossad ha-Rav Kook, 2000).

[38] For some of the Farabian sources of the *Logical Terms,* see I. Efros, "Maimonides' Treatise on Logic," *Proceedings of the American Academy of Jewish Research* 8 (1938): 19–21; Joel L. Kraemer, "Maimonides on the Philosophic Sciences in the *Treatise on the Art of Logic,*" in Joel L. Kraemer, ed., *Perspectives on Maimonides: Philosophical and Historical Studies* (Oxford: Littman Library of Jewish Civilization, 1991), pp. 77–104; idem, "Maimonides' Use of (Aristotelian) Dialectic," in Robert S. Cohen and Hillel Levine, eds., *Maimonides and the Sciences* (Dordrecht: Kluwer, 2000) pp. 111–30; Raymond L. Weiss, "On the Scope of Maimonides' Logic; or, What Joseph Knew," in Ruth Link-Salinger et al., eds., *A Straight Path* (Washington, D.C.: Catholic University of America Press, 1988), pp. 255–65.

without attribution from the short treatises on the *Isagoge* and *Categories*, a frequent practice in medieval and early modern Hebrew logical and philosophical texts.[39] However, Samuel also shows familiarity with Averroes' Epitome of the *Organon* (a short treatise on Aristotelian logic) and with his Middle Commentaries on Aristotle.

The *Logical Terms* attributed to Maimonides appears to have been one of the most widely read works of Jewish philosophical literature. In addition to the version by Moses Ibn Tibbon, it was also translated by Aḥiṭuv the physician (Palermo, thirteenth century) and by Joshua Ibn Vivas (Spain, fourteenth century); the latter was done as a school exercise for "his important study-companion, R. Ezra ben Solomon, of blessed memory, ben Gatino, his teacher in the art of logic."[40] The many extant manuscripts (more than eighty) and printed editions (over thirty) of this work testify to its popularity.[41] It appears to have been used mostly as a primer for students before they began the study of logic; it is sometimes found in manuscripts with more advanced works. There is no evidence that the *Logical Terms* had any impact on Jewish intellectuals until the late thirteenth or early fourteenth century, but because this work owes so much to al-Fārābī, ascertaining such impact would be difficult. The fame of its presumed author ensured that it would be taken into account by such thinkers as Joseph Ibn Kaspi (Provence, 1297–1340) and Moses of Narbonne (Narboni; Provence or Spain, d. 1362); commentaries on it have been attributed to both of them.[42] The work is also mentioned by Gersonides.[43] Other medieval commentaries are attributed to Joseph Albo (Spain, fifteenth century),[44] Abraham Farrisol (Italy, fifteenth century), Moses ben Shem Ṭov Ibn Ḥabib (Portugal, Italy, d. ca. 1505), Mordecai Comtino (Khomatiano; Constantinople, d. ca. 1490), and Samuel ben Saadia Ibn Danan (Fez, early seventeenth century); there are also a number of anonymous commentaries.[45] These commentaries have yet to be studied with the aim of understanding the logical sources and expertise of their authors.

Chronologically sandwiched between the *Glossary of Unusual Terms* and the *Logical Terms* is a somewhat more ambitious exposition of logic, intermediate in difficulty. This is the section on logic in Judah ha-Kohen Ibn Matqah's encyclopedic *Midraš ha-ḥoḵmah* (Investigation of Wisdom). Judah translated his own encyclopedia from Arabic into Hebrew in Italy in 1247. It is the first Jewish compendium of the books of the *Organon*, or more precisely, the first five books of the *Organon*. Judah was interested only in that part of Aristotle's logic that led up to and included the theory of demonstration, because his work dealt with the sciences. Although the section on logic is mostly an abridgment of Averroes' Middle Commentaries on the relevant books, it also contains many elements from al-Fārābī's introductory works

39 See James T. Robinson, "Samuel Ibn Tibbon's *Peruš ha-Millot ha-Zarot* and al-Fārābī's *Eisagoge* and *Categories*," *Aleph* 8 (2008): 97–113. I thank Prof. Robinson for showing me a prepublication draft.

40 These three translations, together with much of the Arabic text in Hebrew characters and a modern English translation, are found in I. Efros, *Maimonides' Treatise on Logic* (New York: American Academy for Jewish Research 1938).

41 For a bibliography of the printed editions, translations, commentaries, and discussions, see Jacob Dienstag, "The Elucidation of the Logical Terms of Maimonides," *Arešet* 2 (1960): 7–37 (in Hebrew). This is updated in idem, "Commentators, Translators and Editors of Maimonides' *Treatise On Logic*: A Bio-Bibliographical Survey," *Koroth* 9 (1986): 269–96 (in Hebrew).

42 Ibn Kaspi's commentary, recently discovered by B. Richler, is being edited by Hannah Kasher and Charles H. Manekin. The commentary attributed to Narboni was edited by M. Hayoun, "The Commentary of Moses Narboni to the 'Logical Terms" of Maimonides," *Daʿat* 10 (1983): 71–92 (in Hebrew).

43 For an apparent reference to the *Logical Terms*, see Manekin, *The Logic of Gersonides*, p. 106.

44 See Dror Ehrlich, "A Commentary on Maimonides' *Treatise on Logic* (*Millot ha-Higgayon*) attributed to R. Joseph Albo," *Daʿat* 60 (2007): 71–102 (in Hebrew).

45 Shalom Rosenberg, "Logic and Ontology in Jewish Philosophy in the Fourteenth Century," Ph.D. dissertation, Hebrew University, 1973, Vol. 1, pp. 56–7 (in Hebrew).

and commentaries, as well as from Averroes' Epitome of the *Organon* (which largely follows al-Fārābī) to fill out the picture.[46]

Averroes' Middle Commentaries on the first five books of the *Organon* were translated by Jacob Anaṭoli, who was Samuel Ibn Tibbon's son-in-law or brother-in-law. Begun in Provence at the instigation of the "scholarly and educated men of Narbonne and Béziers," the translation was completed in 1232 in Naples, under the patronage of Frederick II. Anatoli intended to complete his translation of the remaining four books of the *Organon*, but apparently he never did; they were translated in the next century by Qalonymos ben Qalonymos (*Topics* and *Sophistics*, 1313) and by Ṭodros Ṭodrosi (*Rhetoric* and *Poetics*, 1337). Steinschneider was right to note that there are more manuscripts of Anaṭoli's translation than of any other non-Jewish book (although the number of extant manuscripts declines with each book of the *Organon*), which is no doubt an indication of their subject's popularity. The limited availability of the Middle Commentaries on the last four books explains in part why we have more manuscripts of al-Fārābī's short treatises on them than of those on the earlier books.

By the mid-thirteenth century, then, Jewish intellectuals in Provence and Italy had an array of Hebrew logical texts of varying difficulty at their disposal. The doctrines to which they were exposed stemmed mainly from the introductory works and short treatises by al-Fārābī, although students were increasingly studying Aristotle's own treatises in Hebrew translation "as understood by the sage Averroes," that is, Averroes' Middle Commentaries.

The second half of the thirteenth and early fourteenth centuries saw translations of two other works that were destined to become popular vehicles for the transmission of Arabic Aristotelian logic into Hebrew: Averroes' Epitome of the *Organon* by Jacob ben Makhir in Provence (1288/9) and al-Ghazālī's *Intentions of the Philosophers* by Isaac Albalag (late thirteenth century?). Both works differ in order, structure, and occasionally content from Aristotle's logical writings as paraphrased by Averroes. The Epitome, known in Arabic as *al-Ḍarūrī fī l-manṭiq* (What is Necessary in Logic) and translated by Jacob as *Qiṣṣur mi-kol meleḵet higgayon* (Abridgment of the Entire Art of Logic), is organized around the two types of knowledge that are at the foundation of logic, namely *taṣawwur* (conception) and *taṣdīq* (assent). Subsumed under the former are the components of conception (signification of terms) and what leads to conception (the doctrine of the predicables), as well as what is useful, though not necessary, for conception (the doctrine of the categories). Subsumed under the latter are the structure of assent (the doctrine of the proposition) and what leads to assent (the doctrine of the syllogism), as well as the rules according to which syllogisms are constructed (the doctrine of topical inferences). Having covered the broad outlines of conception and assent, in the second half of the work, Averroes applies them to the five logical arts – demonstrative, sophistic, dialectic, rhetorical, and poetic. Jacob ben Makhir's translation of the Epitome was criticized in the fourteenth century by Samuel ben Judah of Marseilles, who retranslated it in 1329, but the only extant manuscript of the latter's version shows few significant divergences. Under the shortened and misleading title *The Entire Art of Logic*, a title used for various texts, the work was printed in 1559, one of the few works of Hebrew logic printed during the Renaissance.

Al-Ghazālī's *Intentions of the Philosophers* was translated by Isaac Albalag in the late thirteenth or early fourteenth century, by an anonymous writer around the same time,[47] and by the Provençal physician Judah Nathan in the mid-fourteenth century. The first section of this three-part "encyclopedia" deals with logic; because of the popularity of the work as a whole, it

[46] For more details on this work, see Charles H. Manekin, "The Logic of the Hebrew Encyclopedias," pp. 277–300 in *Medieval Hebrew Encyclopedias*, ed. Steven Harvey (Dordrecht: Kluwer, 2000), on pp. 281–7.

[47] The section on logic in this translation, with Narboni's commentary, was edited and translated in G. Chertoff, "The Logical Text of al-Ghazālī's *Maqāsid al-Falāsifa*," Ph.D. dissertation, Columbia University, 1952.

became one of the most widespread presentations of logic among the Jews in the Middle Ages and Renaissance. The number of extant Hebrew manuscripts is surpassed only by that of the manuscripts of the *Logical Terms* and the Middle Commentaries on the *Isagoge, Categories*, and *De Interpretatione*. Here too the section on logic is constructed around conception and assent and is divided into five parts: terms, concepts, propositions, and syllogisms in their formal and material aspects. Their parts correspond roughly to the first five books of the *Organon*, except that the material aspect of the syllogism, that is, the epistemic value of syllogistic premises, is treated in the fourth part and the theory of demonstration in the fifth. The *Intentions* was appreciated by Jews both as an introduction to philosophy, albeit a popular one that required emending (Albalag), and as a convenient manual that obviated the need for further study of profane science (Nathan).[48]

The *Intentions* is significant, too, because al-Ghazālī considers the logic of the philosophers to be mostly correct and no danger to religion; he himself wrote two works on logic, neither of which was translated into Hebrew.[49] This belief in the ideological neutrality of logic appears to have been shared by Jewish scholars in the fourteenth and fifteenth century, even with the decline of Arabic Aristotelianism, the growing influence of Christian Scholasticism, and the rise of kabbalah. Some of the Jewish critics of Aristotelian philosophy in the later Middle Ages – such as Asher ben Jeḥiel, Ḥasdai Crescas, Shem Ṭov Ibn Shem Ṭov, and David ben Judah Messer Leon – focus their critique on what they consider to be the heretical consequences of the study of physics and metaphysics. Occasional pejorative remarks appear to take the word *higgayon* as a synonym for reasoning rather than for the discipline of logic per se.[50]

Some religious antagonism toward the study of logic is found in the controversy over the study of Greek philosophy, which raged in Provence in the early fourteenth century. Some of the participants cited the talmudic dictum "restrain your sons from *higgayon*" and attributed to Hai Gaon the rendering of *higgayon* as *al-manṭiq* ("logic" or "reasoning"). Nevertheless, this interpretation, rebuffed by Jacob Anaṭoli in several works, was not widespread.[51] Moreover, the ban against the study of "Greek wisdom" before the age of twenty-five, promulgated by Solomon Ibn Adret in 1304/5, specifies "physics" and "metaphysics," not logic.[52]

Fourteenth Century

The transmission of Hebrew logic in the thirteenth century was followed by its development in the fourteenth, especially in Provence, as the translation of Arabic manuals, encyclopedias, and commentaries gave way to the production of Hebrew compendia and commentaries. Joseph Kaspi wrote his own abridgment of logic, *Ṣeror ha-kesef* (Bundle of Silver), for his son and his contemporaries, "simpler and more inclusive" than the commentaries of al-Fārābī

[48] See Manekin, "The Logic of the Hebrew Encyclopedias," pp. 287–98, for further information on the impact and logical doctrines of this work.

[49] Al-Ghazālī, *Miʿyār al-ʿilm*, ed. S. Dunya (Cairo: Dār al-Maʿārif, 1964); idem, *Kitāb Mihakk al-nazarī fī al-Manṭiq al-nazar*, ed. R. Ajam (Beirut: Dār al-Fikr al-Lubnānī, 1994).

[50] Cf. the comment by R. Asher b. Yeḥiel, "Our Torah shall not be like your idle conversation, the wisdom of your reasoning [*ḥokmat hegyonkem*], which drove away every religious sage" (*Tešuvot ha-Roš* 55:9), cited in Mordecai Breuer, "Restrain Thy Sons from *Higgayon*," in Itzchak Gilath and Eliezer Stern, eds., *Miktam le-David* (Ramat Gan: Bar-Ilan University Press, 1978), pp. 242–64 (in Hebrew). Breuer, p. 252 n. 53, understands the phrase to mean "autonomous thinking" ("the dictate of reasoning").

[51] Ibid., pp. 251–7. To his sources we may add Ibn Kaspi's *Ṣeror ha-kesef*, in which the author rebuts those who cite this talmudic "prohibition" by saying that *higgayon* refers to the idle conversation of children.

[52] Menaḥem ha-Meiri of Perpigan (1249–1306) argued that although the study of logic precedes the study of science, there are logical doctrines, e.g., the doctrine of the categories, that cannot be learned properly without knowing some natural science.

and Averroes. Because knowledge of Scripture with its commentaries is the pinnacle of knowledge, and this is impossible without knowledge of the art of logic, Kaspi includes only the logical principles needed to understand Scripture. These are drawn from the first five books of the *Organon* and the *Sophistics*, and not from the *Topics*, *Rhetoric*, or *Poetics*, which, he claims, are for idle thinkers. After a person reads the *Bundle of Silver*, he says, there is no need to read the original commentaries. "Hence, I adjure you, Solomon, my son, to read first the *Logical Terms* by the Master (of blessed memory) [i.e., Maimonides], and then this abridgment I have made."[53] Although Kaspi largely follows Averroes' Middle Commentaries in the early books, including an abbreviated treatment of the modal syllogism, he borrows from Averroes' Epitome and al-Fārābī's short treatises, adds examples, and comments on differences with examples from Scripture and the sages.[54] The part corresponding to the *Sophistics* is an abbreviation of al-Fārābī's short treatise and not Averroes' Middle Commentary, which had been translated shortly before in 1313.[55]

Al-Ghazālī's *Intentions of the Philosophers* was commented on twice in the late thirteenth and fourteenth centuries, first by the translator Isaac Albalag and then by Moses of Narbonne.[56] Albalag devotes only a handful of his comments to the section on logic; some of the manuscripts, however, have two interpolated comments, attributed to "Abner," that defend the need to posit a fourth syllogistic figure and criticize the Christian practice of adding five "indirect moods" to the first figure. Vajda identified the author of the glosses with the fourteenth-century Jewish philosopher and apostate Abner of Burgos (1270–1340). Whoever the author is, he seems to be unaware that Galen posited a fourth figure or that Averroes criticized it; both points are mentioned in Averroes' Middle Commentary and Epitome.[57] Moses of Narbonne comments sporadically on the text, occasionally using examples from the Bible and Talmud. He identifies the talmudic principle of *gezerah šawah* with the analogical syllogism and praises the sages for their expertise in the art of logic, because, sensing the weakness of this syllogism, they employed it only when it was grounded in a tradition.[58] Where al-Ghazālī departs significantly from Averroes, Moses of Narbonne points this out.[59] In addition to Moses' commentary, there are commentaries by the Italian poet Moses da Rieti (1388–1460); the Karaite scholar Abraham Bali (ca. 1510; comment only on the first section); Moses Almosnino (1540–1615) of Saloniki, entitled *Migdal ʿoz*; and two anonymous commentaries, one of Provençal origin.[60]

The *Intentions of the Philosophers* introduced its readers to the logical method of Avicenna, little of whose work was translated into Hebrew during the Middle Ages (as far as we know). Selections from Avicenna's works on logic can be found in an anthology of philosophical texts translated by Ṭodros Ṭodrosi and preserved in a single manuscript (London, British Library, Add. 27559). In the section on logic, Ṭodrosi includes excerpts from Fakhr al-Din al-Rāzī's *Eastern Investigations* and *Posterior Analytics*, al-Fārābī's short treatises on Logic and chapter 8 of the Long Commentary on the *Topics*, Avicenna's *Shifāʾ*, Themistius's Paraphrase

53 The introduction was published in L. Dukes, "Das Zeror ha-Qesef von Joseph Ibn Caspi," *Literaturblatt des Orient* 8 (1847): 327–30; for a corrected version, see Shalom Rosenberg, "The *Sophistics* of Joseph Ibn Kaspi: Critical Edition," *Iyyun* 32 (1984): 275–95 (in Hebrew), on pp. 290–1.

54 He contrasts the syllogistic formulations of Averroes with those of al-Fārābī and the Christians, "which is the purer way" (MS Vatican, Biblioteca Apostolica Heb. 283, f. 239b).

55 Some details are given in Rosenberg, "The *Sophistics*."

56 According to Steinschneider, *HÜb*, p. 314, the latter was completed between 1342 (or 1344) and 1349.

57 See Charles H. Manekin, "Some Aspects of the Syllogism in Medieval Hebrew Logic," *History and Philosophy of Logic* 17 (1996): 49–71.

58 Chertoff, "The Logical Text of al-Ghazālī's *Maqāsid*," p. 37a.

59 Ibid., p. 107.

60 See Rosenberg, "Logic and Ontology," Vol. 1, pp. 73–4.

of *Prior Analytics*,[61] al-Ghazālī's *Criterion of Knowledge*, and Averroes' Middle Commentary and Long Commentary on *Posterior Analytics* and Middle Commentary on the *Topics*.[62]

Gersonides

Logical Terms and the *Intentions of the Philosophers* were popular works that spawned popular commentaries. Averroes' Middle Commentaries on the *Organon*, by contrast, called for more advanced commentaries in the tradition of the Greek and Arabic commentators on Aristotle. Such supercommentaries were composed on the first seven books between approximately 1321 and 1323 by Gersonides (Levi ben Gershom, 1288–1344; as noted earlier, the Middle Commentaries on the *Rhetoric* and *Poetics* were not translated into Hebrew until 1337). Apparently assuming that his readers would have access to Anaṭoli's translation of the first five books, but not necessarily to Qalonymos's translations of the *Topics* and *Sophistics*, Gersonides offered only his own commentary on the former but interwove his commentary with the translation of the latter.[63]

Gersonides was unquestionably the most original and significant Jewish logician of the premodern period. His commentary on the first three books of the Middle Commentary takes the form of notes that explain or are (occasionally highly) critical of Averroes; only in the commentary on the *De interpretatione* does one encounter longer quotations from Aristotle, with brief explanations inserted in the text. For *Prior Analytics* and *Posterior Analytics*, the commentary is expanded because of the purported "difficulties" of the former and the "great usefulness" of the latter. His commentary on *Posterior Analytics* was initially planned to be even more extensive, but Gersonides writes that he abandoned this more ambitious project when he heard that "one of the philosopher-commentators of this country" had produced a large commentary on the same book.[64] Gersonides' sources are mostly Averroes' Short Commentary and Middle Commentary, although he mentions al-Fārābī's commentaries and refers to *Logical Terms* obliquely. Although there is no indication that he was familiar with Scholastic logic, like other philosophers in Provence he makes occasional remarks about the "language of the Christians," which may mean either Latin or the vernacular.

Gersonides' commentaries on Aristotle's logic "as understood by Averroes" were used extensively by subsequent Jewish students, to judge by the large number of extant manuscripts and references to it in other works. This is especially true of the commentaries on the *Isagoge*, *Categories*, and *De interpretatione*, which formed the core of logical studies for Jewish intellectuals. In addition, his commentaries were translated into Latin during the Renaissance and printed in the Venice Juntine edition of Averroes (1562–74).[65] It is no exaggeration to say that Gersonides' commentaries achieved the status of classics with which later writers had to reckon. Gersonides' independent positions in his logic commentaries earned him more censure than praise. His contemporary Samuel ben Judah of Marseilles (1294–1340) accused him of "distortion," "deception," and "showing himself among people, in his vanities, as one

61 See Shalom Rosenberg and Bezalel (Charles) Manekin, "Japhet in the Tents of Shem: Themistius' Commentary to the *Prior Analytics*," *Jerusalem Studies in Jewish Thought* 7 (1990): 267–74 (in Hebrew); idem, "Themistius on Modal Logic: Excerpts from a Commentary on the 'Prior Analytics' Attributed to Themistius," *Jerusalem Studies in Arabic and Islam* 11 (1988): 83–103.

62 See Zonta, *La filosofia antica*, pp. 249–53.

63 On the contents of this and the next few paragraphs, see Manekin, "Preliminary Observations," pp. 92–4.

64 See ibid., p. 96, for the suggestion that this is a reference to the 1313 translation by Qalonymus b. Qalonymus of the Long Commentary by Averroes on *Posterior Analytics*, which Gersonides mistook for an independent commentary by Qalonymus.

65 Through the Latin translation, Gersonides' notion of the quantification of the predicate was known to logicians such as Sir William Hamilton and John Stuart Mill. See Manekin, *The Logic of Gersonides*, pp. 24–5.

of the leaders and priests of the philosophers." Samuel's objections and ad hominem attacks on Gersonides are quoted in the commentary by Judah ben Isaac ben Moses Cohen on Averroes' Middle Commentaries on the first three books of the *Organon*.[66] Although Judah describes himself as Samuel's "student," he actually lived much later, probably in the first half of the fifteenth century in northern Italy.[67] Zonta has suggested that Judah had access to a commentary by Samuel ben Judah on Averroes' Middle Commentary, that the citations Judah attributes to al-Fārābī are taken from the latter's Long Commentary on the *Categories*, and that it was Samuel ben Judah who translated that work from the Arabic.[68]

By far the most devastating critic of Gersonides' commentary was Judah ben Jehiel Messer Leon (c. 1425–98), one of the central figures of Italian Jewry during the Renaissance and, as we shall subsequently see, the chief representative of what may be termed "Hebrew Scholastic logic." Judah attempted to ban the reading of Gersonides' commentary on the Pentateuch; in his own commentary on the Middle Commentaries on the *Isagoge*, *Categories*, and *De interpretatione*, he frequently criticizes Gersonides' commentary, referring always to him as "the wise in his own eyes."[69] More temperate criticisms of Gersonides can be found in yet another commentary on the first four books of the *Organon*, that by "the sage Eli," whom Steinschneider identified with the fifteenth-century Spanish Jewish translator and philosopher Eli Habillo, although this identification has recently been questioned.[70] Other anonymous commentaries cite Gersonides' commentary; one of them occasionally defends him against the criticisms of "Eli, known as Geronimo."[71] Abraham Bibago, an older contemporary of Eli Habillo's, wrote a commentary on Averroes' Middle Commentary on *Posterior Analytics* in which he criticizes Gersonides. More than any other commentator, he remarks, Gersonides had been led by confusions and mistakes to disagree with Averroes on several points and "to spout nonsense upon nonsense" in his commentary.[72]

Despite the influence of Gersonides' commentaries on subsequent Jewish intellectuals (Moses da Rieti rendered it in couplets in his *Miqdaš meʿaṭ!*), they are not his most interesting work from the standpoint of the history of logic. That distinction goes to the *Sefer ha-Heqqeš ha-yašar* (Book of the Correct Syllogism, or, perhaps, the Correct Book of the Syllogism), which contains his treatment of syllogistic and nonsyllogistic inference. The *Correct Syllogism* was Gersonides' earliest work, completed in 1319; however, he revised it significantly later, after he had commented on Averroes' Middle Commentary on *Prior Analytics* and after he had read and commented on two of Averroes' *Logical Questions*.[73] Many of the questions were translated in 1320 by Samuel ben Judah of Marseilles.[74] Gersonides' acquaintance with

66 On the substance of Samuel's criticisms, see Mauro Zonta, "Una disputa sugli universali nella logica ebraica del Trecento. Shemuel di Marsiglia contro Gersonide nel 'Supercommento all' Isagoge' di Yehudah b. Ishaq Cohen," *Documenti e studi sulla tradizione filosofica medievale* 11 (2000): 409–58.

67 See Mauro Zonta, "Fonti antiche e medievali della logica ebraica nella Provenza del Trecento," *Medioevo* 23 (1997): 515–94, on pp. 525–6 and 546–55.

68 See Mauro Zonta, "Al-Fārābī's *Long Commentary* on Aristotle's *Categoriae* in Hebrew: A Critical Edition and English Translation of the Newly-Found Extant Fragments," in Binyamin Abrahamov, ed., *Studies in Arabic and Islamic Culture II* (Ramat Gan: Bar-Ilan University Press, 2006), pp. 185–254.

69 See Isaac Husik, *Judah Messer Leon's Commentary on the* Vetus Logica (Leiden: Brill, 1906), pp. 93–108.

70 Mauro Zonta, in *Hebrew Scholasticism in the Fifteenth Century: A History and Source Book* (Dordrecht: Springer, 2006), p. 167, regards this as a doubtful work.

71 See Manekin, "Preliminary Observations," p. 82.

72 MS Paris, BNF Héb. 959, f. 10v.

73 Namely Questions 11 and 13 in the Averroes Database of the Thomas-Institut, Cologne (available online at http://www.thomasinst.uni-koeln.de/averroes/averdat13.htm); and Questions 5 and 9, according to the Latin Juntine edition (see Steinschneider, *HÜb*, pp. 101–3). Question 11 was translated by Samuel b. Judah; Question 13, by Qalonymus b. Qalonymus. Gersonides, who incorporates the translations into his commentary, does not identify the translators.

74 Rosenberg, "Logic and Ontology," Vol. 1, pp. 89–90.

Averroes' "new" doctrine in the two *Questions* led him to retract some criticisms, rethink others, and come up with new ones.

The centerpiece of the *Correct Syllogism* is Aristotle's theory of modal inference, one of the notoriously difficult areas of Aristotelian philosophy that continues to bedevil commentators to this day. Gersonides took it upon himself to correct the errors in Aristotle's modal logic, notably in the validity of the conversion of modal premises and modal syllogisms and the assessed modality of their conclusions. To do this he broadened the scope of the book to deal with all inference, immediate and mediate (i.e., syllogistic). His treatment of inference is by the far the most formalized by any Jewish scholar and arguably the most formalized in all of premodern logic. First positing and defending a set of rules that yield "consequences by virtue of the whole and the part," he deduces through them the laws of conversion and subalternation, justifies the various conditions of the syllogism, investigates the concludent premise-pairs, and constructs the rules of inference for arguments with modal premises. Along the way he provides a spirited defense of the fourth syllogistic figure against the criticisms of Averroes (the first such defense made in Europe), considers inferences with quantified predicates, as well as relational terms and prepositions, and provides several interpretations of modal operators. Yet for all its innovation – no doubt because of it – the *Correct Syllogism* left little mark on subsequent Jewish intellectuals. The work was translated into Latin during the Renaissance, and that was the last that was heard of it. [75]

Fifteenth Century

The study of Arabic-Hebrew logic continued in Provence well into the fifteenth century, even after the general decline of philosophy. Two works testify to the enduring interest of this material: the *Royal Treasure* (*Segullat melaḵim*), a compendium of logic, metaphysics, and physics in verse, by Abraham Abigdor (Arles, fl. 1367–93); and a lengthy commentary on Averroes' Epitome of the *Organon* by Mordecai Nathan (Avignon, mid-fifteenth century). Considering that by the end of the fourteenth century, there were quite a few compendia and commentaries on logic in Provence, both authors had to justify producing new works. Abraham also had to explain why the sections of his poem on metaphysics and physics were adaptations of the *Intentions*, whereas the section on logic followed mainly, although not exclusively, the Middle Commentaries on the first four books of the *Organon*. He decided not to follow the *Intentions* for logic, because its treatment thereof was too brief and did not consider syllogisms with premises of varying modality. He considered al-Ghazālī's work sufficient only in the section on demonstration. Abraham's work presents the key doctrines of the Middle Commentaries in abbreviated fashion while employing material from several sources.[76]

Mordecai Nathan's commentary on the Epitome appears to be the last Hebrew work on logic produced in Provence. In the introduction the author explains that the Epitome was sufficient for anybody who desires to "open his eyes" in the study of logic, but that it needed a commentary, and no commentary by Gersonides on that work had reached him. The influence of Scholastic logic is felt, especially in the section on the syllogism, where Mordecai cites the *Tractatus* by Peter of Spain.[77] He points out the difference between the

75 See Gilbert Dahan, "Les traductions latines médiévales des œuvres de Gersonide," in C. Nahon and G. Dahan, eds., *Gersonide en son temps. Science et philosophie médiévales* (Louvain: Peeters, 1991), pp. 329–68.

76 For an examination of this work, see Steven Harvey and Charles H. Manekin, "The Curious *Segullat Melakhim* by Abraham Avigdor," in J. Hamesse and O. Weijers, eds., *Ecriture et réécriture des textes philosophiques médiévaux. Mélanges offerts à C. Sirat* (Turnhout: Brepols, 2006), pp. 215–52.

77 See MS Oxford, Bodleian Mich. 355, f. 44b, where Mordecai refers to it as "Traktaz Espan."

proof procedures of Peter and of Averroes, cites the Latin mnemonic "*Barbara, Celarent*," and explains its meaning to his readers. It is clear that he was familiar with the Latin text of the *Tractatus*; it is less certain whether he was familiar with Abraham Abigdor's Hebrew translation of the *Tractatus*. In any event, in fifteenth-century Provence, a classic like Averroes' Epitome had been supplemented with a commentary that takes the Scholastic tradition for granted. As we shall see, Scholastic logic began to make inroads among Jewish intellectuals even earlier in Provence, Italy, and Spain.

SCHOLASTIC LOGIC IN HEBREW GARB

We noted earlier that among medieval Jews, the fundamental texts for the study of logic were those of the Arab Aristotelians, either directly or by means of abridgments and compendia. The Jews' marginalized status in Christian Europe during the High Middle Ages, the institutional and linguistic constraints of Scholastic philosophy, the high esteem accorded to the Arabic philosophers, and the weight of tradition are only some of the reasons why the Arabic-Hebrew tradition of logic never entirely lost its attraction. Still, beginning in the fourteenth century in Provence and Italy, and the fifteenth century in Spain, one finds first acquaintance with Scholastic logic and then Hebrew Scholastic logic itself. Much of this logic was familiar, because both Arabic and Latin logic derived in large part from the Aristotelian canon. Nevertheless, there were whole areas of Latin logic that had no counterpart in the Arabic tradition, such as supposition and syncategorematic theory, or the theory of consequences and insolubles. Concerns with semantics and logical consequence arose in conjunction with the characteristic activity of Scholastic philosophy, the classroom disputation, which gave rise to the theory of obligations, in which participants are obliged to answer in certain ways. Even where there were counterparts in the Arabic tradition, as in the *logica antiqua*, which dealt with the subjects of the Aristotelian *Organon*, there were differences of approach, formulation, and doctrine.[78]

The earliest dated work that draws on Scholastic logic is a translation and adaptation of an extensive gloss commentary on the thirteenth-century *Tractatus* by Peter of Spain, by one Ḥezekiah Bar Ḥalafta (1320). In the introduction Ḥezekiah writes that he had come across a Latin gloss commentary on that popular work, or as he puts it, "a commentary (*beʾur*) of the *Comprehensive Introduction on All the Principles of Logic* . . . called *Traktat* in their language." Ḥezekiah translated the commentary because of its usefulness in disputations with Christians, its value in sharpening the mind, and its brevity and comprehensiveness. As was the practice of other Hebrew translators of this period, Ḥezekiah does not translate word for word; rather he introduces glosses that cite freely from the Jewish and Arabic philosophical traditions and "Judaizes" the material when possible.[79]

A more telling example of literary appropriation through adaptation is found in Abraham Abigdor's translation of the *Tractatus* in the late fourteenth century. Abraham did not hesitate to replace Peter's definitions with others taken from the Arabic Aristotelian tradition; in the section on the *Categories*, he weaves long passages of Averroes' Middle Commentary into the text, substituting them for the Latin text where possible. In the work's only personal gloss,

78 See Charles H. Manekin, "Scholastic Logic and the Jews," *Bulletin de l'étude de la philosophie médiévale* 41 (1999): 123–47.

79 See Zonta, "Fonti antiche," pp. 583–94; cf. Charles H. Manekin, "When the Jews Learned Logic from the Pope: Three Medieval Hebrew Translations of the *Tractatus* of Peter of Spain," *Science in Context* 10 (1997): 395–430, on p. 397. The identification of the author of the *Tractatus* with Pope John XXI is not at all certain. See Angel d'Ors, "Petrus Hispanus O.P., Auctor Summularum," *Vivarium* 35 (1997): 21–71; Simon Tugwell, O.P., "Petrus Hispanus: Comments on Some Proposed Identifications," *Vivarium* 37 (1999): 103–13. At any rate, none of the Jewish versions mentions the pope as author.

Abraham informs his audience of the Christian practice of listing the major premise first; he has to mention this divergence from the Arabic tradition to explain the Scholastic "*Barbara, Celarent*" mnemonic, which assumes this order. (Moses of Narbonne makes a similar remark in his commentary on the *Intentions of the Philosophers*.[80]) Abraham's version of the *Tractatus* was the most popular, arguably because it showed the greatest fidelity to Averroes and the least fidelity to the Latin original. Attempts to emend and revise it are found in Italy, where it achieved wide diffusion.[81]

Both Abraham and Mordecai Nathan were physicians; the growing popularity of the *Tractatus* among the Jews in the fourteenth and fifteenth centuries probably was related to the growing appreciation of Scholastic medicine. Another translator of the *Tractatus* was also a physician, Judah ben Samuel Shalom, who, like Abraham Abigdor, translated works on medicine and astrology–astronomy.[82] In Provence and in Aragon, Jewish physicians were certified before a mixed tribunal of Jews and Christians "in a Scholastic ritual, with *quaestiones et reponsiones*, *disputationes*, *rationes et argumentationes* requiring a mastery of medical authorities."[83] Therefore, presumably a rudimentary knowledge of Scholastic logic would be necessary to future Jewish physicians, the more educated of whom would have begun their studies with logic.

There were other motivations for translating the *Tractatus* besides the study and practice of medicine. The earliest Hebrew version of the *Tractatus*, presented by its translator "R. Shemariah" as his own original work, *Sefer ha-Higgayon*, was intended to be a primer in the "science of grammar and dialectic" (*ḥokmat ha-mivṭa' we-ha-higgayon*)[84] for readers of his philosophical commentaries on Scripture. Because those commentaries could be comprehended only with a knowledge of science, and because that knowledge presupposes proficiency in logic, Shemariah would include "all that is necessary for the readers of my books and commentaries to know."[85] The "author" does his best to disguise the book's foreign origin by writing in the first person and substituting Hebrew linguistic phenomena for Latin. This practice breaks down when he gets to the fallacy of accent, at which point he is forced to give examples from "a foreign tongue," that is, Latin. Steinschneider identified "Shemariah" with Shemariah ben Elijah of Negroponte "the Cretan" (d. 1358), who had begun his career as a translator under the patronage of Robert d'Anjou in Naples. It is possible that the translator "recycled" one of those earlier translations and presented it as his own work; he then expanded it in certain sections. Shemariah apparently felt that his students would do better to receive their background in philosophy from his own writings, for once they read his commentaries, "their heart will not turn to non-Jewish sciences." [86]

Shemariah's appropriation of Scholastic logic does not seem to have had much influence on subsequent Byzantine Jewish writing on logic. The *Book of Logic* by Elijah ben

[80] Chertoff, "The Logical Text of al-Ghazālī's *Maqāsid*," p. 78.

[81] Manekin, "When the Jews Learned Logic from the Pope," pp. 406–17.

[82] Ibid., pp. 424–5.

[83] L. García-Ballester, L. Ferre, and E. Feliu, "Jewish Appreciation of Fourteenth-Century Scholastic Medicine," *Osiris* 6 (1990): 85–117.

[84] Or perhaps this should be "science of logic and dialectic." Shemariah translates *ars grammaticus* as *ḥokmah mivṭa'it* and *dialectica* as *ḥokmah higyonit* (MS Leiden, Bibliotheek der Rijksuniversiteit Or. 4780, f. 214b). However, *ḥokkmat ha-mivṭa'* was also used in twelfth-century Spain for logic. See Abraham Ibn Ezra, *Yesod mora'*, ed. Y. Kohen (Ramat Gan: Bar-Ilan University Press, 2002), 1.5, p. 77; 1.9, p. 86; 2.1, p. 88; et passim. Cf. Rosenberg, "Logic and Ontology," Vol. 2, p. 116 n. 11. Perhaps Shemariah took *mivṭa'* to mean the semantic aspect of logic and *higgayon* the argumentative aspect; cf. Judah Ibn Matkah's *Midraš ha-ḥokmah*, where *'ibāra* is rendered as *mivṭa'*. The matter deserves further study.

[85] MS Leiden, Bibliotheek der Rijksuniversiteit Or. 4780, f. 179a.

[86] See Steven Bowman, *The Jews of Byzantium: 1204–1453* (Tuscaloosa: University of Alabama Press, 1985), pp. 131–3 and 255–64, on p. 261.

Eliezer (Crete, late fourteenth century), written in question-and-answer form, shows no signs of Scholastic influence and unapologetically divides the syllogism into four figures.[87] Unlike Shemariah, Elijah treats the indirect moods of the first figure as fourth-figure moods. By contrast, Aaron ben Elijah of Nicomedia, in his *Tree of Life*, mentions and rejects the fourth figure as "nonsense" (*hevel*), implying that it contains circular reasoning.[88] Similarly, the *Offering for Judah*, a work on logic by Aaron's younger contemporary, Joseph ben Moses Kilti "the Greek" (late fourteenth century), shows no evidence of Scholastic logic. Only later, in Mordecai Comtino's commentary on *Logical Terms*, do we find some familiarity with the Latin logic manuals of the Renaissance, perhaps because of the ties between Venice and Constantinople. Comtino is one of the first Jewish logicians to mention the so-called false fourth figure of the Renaissance logicians, which is really a first-figure syllogism with transposed premises. He allows that there are four possible figures but holds that only the first three are significant.[89] Comtino wrote a philosophical commentary on the Torah, "containing logic and grammar, whereby the Torah is elucidated." Like Shemariah, if less enthusiastically, Comtino believed that logic was important for the study of Scripture.[90]

A third motivation for the study of Scholastic logic was to prepare Jews for religious disputations with Christians. We saw earlier that Ḥezekiah Bar Ḥalafta intended his translation of and commentary on the *Tractatus* to help Jews prepare for disputations (whether religious disputations he does not say). Similar justifications for the study of Scholastic logic are offered by Jewish intellectuals in Spain and in Italy.[91] Moses da Rieti lists the Latin names of the fourteen direct syllogistic moods, with examples, to aid Jewish religious disputants "so that their syllogisms not be rejected [by the Christians] as ill-formed, although their opinions are correct." His concern appears to be with the order of the premises, which differs in the Arabic and Scholastic traditions. He makes the important remark that the order of the premises in the syllogism does not matter, provided that the syllogistic rules are observed – a logical point that was disputed as late as the nineteenth century. Rather than provide a more detailed explanation of the information embodied in the mnemonic, however, da Rieti refers his reader to the *Tractatus*, presumably in one of its Hebrew versions.[92]

Although these practical motivations for the study of logic from Latin sources were of importance, clearly some Jews were simply attracted to the new kind of logic. The Spanish Jewish poet Solomon Bonafed (late fourteenth to early fifteenth century) relates a disagreement he had with a student of Isaac Arondi, a well-known Spanish Jewish scholar of the previous generation, over the merits of studying Scholastic logic. Solomon had written to Arondi's student that he was studying logic in Latin with a Christian sage and went on to praise this new logic as superior to the confused and perplexing translations of Averroes. Arondi's student dismissed the Christian schoolbooks as inferior because they omitted the theory of the modal syllogism and the theory of demonstration.[93]

87 The work was edited by Shalom Rosenberg, *Daʿat* 1 (1978): 63–71; 2–3 (1979): 127–38; 7 (1981): 73–92.

88 See *Etz Chayyim: Ahron ben Elia's aus Nikomedien des Karäers System der Religionsphilosophie* . . . , ed. F. Delitzsch and M. Steinschneider (Leipzig: J. A. Barth, 1841).

89 See Comtino's commentary in *Millot ha-higgayon*, ed. David Slucki (Warsaw: Baumritter, 1865), p. 23a.

90 See Jean-Christophe Attias, *Le Commentaire biblique: Mordekhai Komtino ou l'herméneutique du dialogue* (Paris: Le Cerf, 1991), p. 72.

91 See Manekin, "Scholastic Logic and the Jews," pp. 130–3.

92 MS Berlin, Staatsbibliothek–Preussischer Kulturbesitz 269, f. 33v.

93 See MS Oxford, Bodleian Mich. 155 (formerly 809) (Neubauer 1984), f. 89b, cited in A. Neubauer, *Catalogue of the Hebrew Manuscripts in the Bodleian Library* . . . (Oxford, 1886–1906), Vol. 1, p. 674. For the general phenomenon of Jewish appreciation of Scholastic philosophy in the fourteenth and fifteenth centuries, see Zonta, *Hebrew Scholasticism*, pp. 22–31.

Jewish enthusiasm did not often extend to all aspects of Scholastic logic. None of the various Hebrew versions of the *Tractatus*, for example, cover the entire work; the versions with the greatest popularity, to judge from the number of extant manuscripts, treat less than half of it. As usual, Jewish readers were interested mainly in the *logica antiqua*, the standard material of the Aristotelian *Organon* (less the *Posterior Analytics*), because it corresponded by and large to the subject matter of logic as reflected in the popular primers and commentaries of the Arabic-Hebrew logical tradition and was not bound to the peculiarities of Latin. In contrast, the *logica modernorum* developed by Scholastic logicians in the twelfth and thirteenth centuries was of considerably less interest. Thus, although Jews became familiar with Scholastic logic through the Hebrew translations of the *Tractatus*, their familiarity extended generally to those doctrines that, with one notable exception, were not the newest or the most distinctive or the most closely connected to Latin.[94] That exception was the Scholastic treatment of the syllogism, especially the *Barbara, Celarent* mnemonic, which seems to have been quite important, considering the number of attempts to render it in Hebrew.[95] As the Renaissance humanist Yoḥanan Alemanno complained,

> it is not sufficient to know whether a syllogism is *Barbara* or *Celarent* or *Baroco*. Rather wisdom consists in knowing the different types of premises that compose the syllogism, whether they be axioms or conventional or false, as al-Ghazālī states in his *Intentions*.[96]

Scholastic logic is not included in Alemanno's study program; his inclusion of Judah Messer Leon's commentary on the first books of Averroes' Middle Commentary on the *Organon* reflects his own conservatism.[97] In any event, there must have been enough educated Jews who prided themselves on their knowledge of *Barbara, Celarent* for Alemanno's criticism to be significant.

More advanced works of Scholastic logic were translated and composed in Hebrew in the fifteenth century. In Spain, Abraham Shalom (d. 1492) translated a series of disputed *quaestiones* on the *Isagoge*, the *Categories*, and the *De interpretatione*, which he attributed to *he-ḥakam Marsilio* ("the sage Marsilio").[98] A. Jellinek and subsequent scholars assumed this to be Marsilius of Inghen, but no work by that scholar has been found to match the *quaestiones*. Abraham Shalom's introduction to the *quaestiones* includes the longest and most thorough apologia for the study of logic in Jewish literature. He urges his co-religionists to study Scholastic methods to protect themselves from the "scourge" of the proofs of the Christians (apparently in disputations), and to avoid being mocked for their ignorance.[99]

Abraham Shalom's acquaintance and philosophical correspondent Eli Ḥabillo translated several Scholastic tracts on logic concerning the problem of universals.[100] M. Zonta has shown that one of these is identical with the version of Vincent Ferrer's *De unitate universalis*

94 As we shall subsequently see, the exception is Judah Messer Leon, whose *Miḵlal yofi* covers the entire gamut of Scholastic logic.

95 Shalom Rosenberg, "'Barbara, Celarent' in Hebrew Garb," *Tarbiz* 48 (1979): 74–98 (in Hebrew).

96 See *Ḥešeq Šelomoh*, MS Berlin, Staatsbibliothek–Preussischer Kulturbesitz Or. 832, ff. 235–6.

97 See Moshe Idel, "The Study Plan of Rabbi Yoḥanan Alemanno," *Tarbiz* (1978–9): 303–31 (in Hebrew).

98 Abraham Shalom's translation is extant in two manuscripts: MS Paris, BNF Héb. 991; MS Cambridge, Mass., Harvard-Houghton Heb. 38/1, ff. 1a–57b.

99 The introduction is found in A. Jellinek, *Marsilius ab Inghen* (Leipzig: Leiner, 1859).

100 For a description of MS Parma, Biblioteca Palatina 2631 (De Rossi 457) and background information on Eli, see Jean-Pierre Rothschild, "Questions de philosophie soumises par Eli Ḥabilio à Šēm Ṭōb Ibn Šēm Ṭōb, v. 1472," *Archives d'histoire doctrinale et littéraire du Moyen Age* 61 (1994): 105–32. This manuscript is very difficult to read in places.

used by Petrus Niger.[101] Two others are the four chapters on universals from Ockham's *Summa logicae* (Part I, chapters 14–17)[102] and the *De universalibus* mistakenly attributed to Aquinas.[103] The four chapters from the *Summa logicae* are the only known Hebrew translation of Ockham's popular textbook. The same manuscript contains a short treatise on universals (ff. 117a–121a), an elementary treatise on logic, mostly material from the *Categories* (ff. 121a–126b), and two additional works on universals (ff. 144b–146a and 146a–148a), which may well be further translations by Eli, who was an ardent advocate of Scholastic philosophy.[104]

The fullest Scholastic influence on Hebrew logic was felt in Italy, first in the writings of individuals and then in the education of Italian Jewish youth. I already noted Shemariah the Cretan's ties to the court of Robert d'Anjou; another translator associated with that court was Judah Romano, whose anthology of philosophical *quaestiones* includes excerpts from the commentaries on *Posterior Analytics* and the *Rhetoric* by Giles of Rome and commentaries and writings on *De interpretatione* and the *Categories* by Angelus de Camerino. Another of Romano's anthologies includes a translation of an excerpt from the *De fallaciis ad quosdam nobiles*, mistakenly attributed to Aquinas.[105]

Abraham Abigdor's translation of the *Tractatus* entered northern Italy in the early fifteenth century from Provence. The problematic and incomplete nature of Abigdor's translation appears to have led some Italian Jewish scholars to revise and add to it on the basis of the Latin original. In one manuscript (MS Paris, BNF héb. 929, written in Italy in 1472) there is a translation of *De fallaciis ad quosdam nobiles artistas* instead of Peter's *De fallaciis*, a common substitution in Italian manuscripts of the *Tractatus*. A study of fifteenth- and sixteenth-century Italian manuscripts containing Abigdor's translation provides illuminating information about the place of logic in the education of Italian Jewish youth. In many of them, Abraham Abigdor's translation of Peter's *Tractatus* is juxtaposed with classics of the older tradition, such as Samuel Ibn Tibbon's translation of Maimonides' *Logical Terms* and Ibn Kaspi's *Bundle of Silver*, or the logical section of al-Ghazālī's *Intentions of the Philosophers*. There are often marginal glosses that alert the student to parallels in the Scholastic tradition, such as the Latin names of the syllogism or Hebrew versions of *Barbara, Celarent*. By contrast, the marginal glosses in the *Tractatus* translations note the differences between the Arabic and Latin traditions, especially in the syllogism, with the aforementioned difference in the order of premises. Even when Scholastic logic began to make inroads in Jewish circles, through the *Tractatus* and independent Jewish works influenced by Scholastic logic, it coexisted with rather than supplanted the older Hebrew logical tradition. Because the *Tractatus* is

101 See Mauro Zonta, "The Original Text of Vincent Ferrer's *Tractatus de Unitate Universalis* Discovered in an Unknown Hebrew Translation?" *Bulletin de philosophie médiévale* 39 (1997): 147–51. Zonta (*Hebrew Scholasticism*, pp. 173–4) believes that the attribution is probable.

102 MS Parma, Biblioteca Palatina 2631 (De Rossi 457), ff. 159b–164b. For a description of the manuscript, see Giuseppe Tamani and Mauro Zonta, *Aristoteles Hebraicus: Versioni, commenti, e compendi del* Corpus Aristotelicum *nei manoscritti ebraici delle biblioteche italiane* (Venice: Supernova, 1997), pp. 139–40.

103 MS Hamburg, Staats- und Universitätsbibliothek, Cod. hebr. 266 (Steinschneider 267), ff. 161r–165v. From a cursory glance, this matches, more or less, the edition published by Paul Mandonnet in *Opuscula Omnia* (Paris: Lethielleux, 1927), Vol. 5, pp. 383–91. MS Parma, Biblioteca Palatina 2631, ff. 117a–121a, begins *ma'amar kolel me'et tomas di haqvino*, but it differs from the Hamburg manuscript.

104 For an examination of the Hebrew Scholasticism of Abraham Shalom and Eli Ḥabillo, with translations and paraphrases of key texts in their correspondence, see Zonta, *Hebrew Scholasticism*, pp. 165–209. For some of Eli's statements in praise of Scholastic philosophy, see Rothschild, "Questions de philosophie," p. 111 n. 29; E. Kuppfer, "Identification of Manuscripts from the Institute of Microfilmed Hebrew Manuscripts," in *Proceedings of the Fifth World Congress of Jewish Studies, Division V* (Jerusalem: World Union of Jewish Studies, 1969), pp. 131–8, on p. 136 (in Hebrew).

105 See G. Sermoneta, "Jehudah b. Mosheh b. Dani'el Romano, traducteur de Saint Thomas," in G. Nahon and C. Touati, eds., *Hommage à Georges Vajda: Etudes d'histoire et de pensée juives* (Louvain: Peeters, 1980), pp. 231–62, on. p. 262.

an elementary textbook of logic, some of the Italian manuscripts were copied by younger students as part of their education.

So far we have considered either Hebrew translations of Scholastic logic or Jewish logicians who were influenced by certain Scholastic doctrines. With Judah ben Jeḥiel Messer Leon, a prominent Italian rabbi of the second half of the fifteenth century and leading Jewish intellectual, we encounter something new: a Jewish Scholastic logician writing in Hebrew. Messer Leon is commonly known for his treatise on Hebrew rhetoric, *Nofet ṣufim* (The Drippings of the Honeycomb), the first book of Hebrew literature printed in its own author's lifetime. He also wrote a comprehensive book of Hebrew grammar, *Livnat ha-sappir* (The Sapphire Pavement), and an introductory textbook on logic, *Mik̲lal yofi* (The Perfection of Beauty), making him the only Jew of the Middle Ages and Renaissance to write on the entire trivium. It is likely that Messer Leon wrote them for use in the academies he headed in his various places of residence, which combined the study of traditional Jewish texts with secular learning.[106]

I noted earlier that Messer Leon wrote on the Middle Commentary on the *Isagoge, Categories,* and *De interpretation.* I. Husik argued that these supercommentaries are heavily dependent on Burley's *Expositio super artem veterem.*[107] Some manuscripts contain his commentary on the Middle Commentary on *Prior Analytics* and *Posterior Analytics*; his student, David ha-Sefaradi, refers to the latter as a translation of writings of Paul of Venice.[108] Until a study of Messer Leon's logical writings is conducted against the backdrop of his sources, we will not know whether he was a serious logician or merely an artful compiler.

For Messer Leon, the Christian logicians and Averroes were authorities not to be challenged. Misunderstanding them led not only to logical error but also to theological heresy. Thus, in the introduction to the *Perfection of Beauty*, Messer Leon supplements the conventional motives for writing a new logical textbook with the need to combat the "sophistries and deceits" of the "pseudo-philosophers among our co-religionists." Although Gersonides is not mentioned by name, there is much evidence that he was widely read by Italian Jews in the fifteenth century; presumably the *Perfection of Beauty* was part of Messer Leon's wider campaign against Gersonides' influence. It should be emphasized that Messer Leon's use of Scholastic logic was not directed against the older logical tradition of the Arabic Peripatetics. On the contrary, he saw himself as a defender of Averroes and Aristotle against the bold and audacious attacks by the heterodox Gersonides.

The sources of the *Perfection of Beauty* have not yet been studied, although Rosenberg noted the influence of the *Logica parva* by Paul of Venice.[109] (In fact, the copyist of one of the manuscripts, BNF héb. 994, considered it to be an abridgment of Maestro Paulo's logic.) However, it is not a slavish translation of Paul, and Messer Leon certainly employed other sources. The textbook encompasses almost the entire range of Scholastic logic, including obligations and insolubles, or, to be more precise, the entire range of elementary Scholastic logic. It is extant in approximately thirteen manuscripts. The translator-philosopher Abraham Farissol, who had studied at Messer Leon's academy, produced an abridgment of it.

[106] See D. Carpi, "Notes on the Life of Rabbi Judah Messer Leon," in Elio Toaff, ed., *Studi sull'ebraismo italiano in memoria di Cecil Roth* (Rome: Barulli, 1974), pp. 37–62; cf. Hava Tirosh-Rothschild, *Between Worlds: The Life and Thought of Rabbi David b. Judah Messer Leon* (Albany: SUNY Press, 1991), pp. 24–33.

[107] See Husik, *Judah Messer Leon's Commentary*, p. 81. Because many more texts are available now than were to Husik in 1906, a fresh examination of Messer Leon's sources in all his works is a desideratum.

[108] Zonta, *Hebrew Scholasticism*, p. 212.

[109] Rosenberg, "Logic and Ontology," Vol. 1, p. 48. Rosenberg sees the influence of Strode and Ockham on various parts of the work, but no references are provided.

Zonta provides the text and English paraphrase of what appears to be a work by Messer Leon, or one of his students, a Compendium and Questions on Porphyry's *Isagoge*, followed by a Compendium on the *Categories*, preserved in two manuscripts.[110] Although Steinschneider and Vajda considered these to be by Messer Leon,[111] Zonta points out that the questions are not the same as those discussed in Messer Leon's commentary on Averroes' Middle Commentary on the *Isagoge*, despite some similarities. Some of the questions and discussions show a marked similarity to the *Quaestiones in Veterem artem* by Radulphus Brito.[112]

Finally, we should note a treatise on logic by the physician-philosopher Moses ben Judah Galiano (mid-sixteenth century), a translator from both Arabic and Latin, which covers the material from the *Isagoge* and the *Categories*.[113] The section on the *Isagoge*, which reads like a typical Scholastic treatise, is divided into seven sections: (1) Introduction to the Art of Logic; (2) The Subject of the Art of Logic; (3) Explanation of the Signification of Terms; (4) Explanation of [the Question] Whether It Is Necessary to Mention the Five Universals That Customarily Introduce Books of Logic; (5) Explanation of the Essence of the Universals, the Particular, and the Individual; (6) Explanation of the Meaning of Substantial and Accidental; and (7) Explanation of Each of the Universals. Moses defends Aristotle and Averroes against the objections of more recent authors; he cites Boethius, Albertus Magnus, Aquinas, Duns Scotus, and Burley "the sophist," among others.

AFTERWORD: THE USE OF LOGIC IN MEDIEVAL JEWISH SCRIPTURAL AND TALMUDIC EXEGESIS

Although the focus here has been on Jewish works on logic proper, some remarks about the application of logic in other areas of medieval Jewish intellectual life would seem to be in order. Needless to say, the study of logic had a great impact on the philosophical and theological commentaries and compendia produced by medieval Jewish intellectuals, in terms of both form and content. Nonetheless, even in classically Jewish scholarly pursuits such as biblical and talmudic exegesis, one can find the mark of Aristotelian logic as well as the argument that knowledge of logic is necessary for understanding the sacred books.

Thus, a century before Shemariah of Negroponte "composed" his *Higgayon* so that his students would understand his scriptural commentaries, Samuel Ibn Tibbon had inserted a summary of Aristotle's syllogistic and theory of demonstration into his commentary on Ecclesiastes, so that readers could understand the point of the book. According to Ibn Tibbon, King Solomon (the traditional author of Ecclesiastes) wished to present the philosophers' arguments against the immortality of the soul, and then to assess their force. These arguments pose skeptical doubts and difficulties but are not demonstrative. Solomon's own method is to argue inductively for the proposition "everything is vain under the sun" and then to argue persuasively that certain things, for example, the separate intellects and the spheres, are incorruptible. Even a few select human intellects can survive the corruption of the body. To understand the distinction between demonstrative and dubious arguments and the distinction between proofs that establish something without explaining why and proofs

110 MS Paris, BNF Héb. 994, ff. 85r–91r; MS Florence, Biblioteca Medicea Laurentiana Pluteo I, n. 26.

111 *HÜb*, p. 80. Vajda, in his unpublished annotations to some of the manuscripts of the Bibliothèque nationale, writes of the commentary that it is "sans doute aussi de Juda Messer Leon." Zonta calls the attribution "most probable" (*Hebrew Scholasticism*, pp. 212, 280–3). In any event, it appears rather likely that it emanates from Messer Leon's milieu.

112 Zonta, *Hebrew Scholasticism*, pp. 287–303.

113 On Galiano, see Abraham David, "*Taʿalumot ḥokmah* by R. Moses b. Judah Galiano," *Qiryat Sefer* 73 (1990/1): 1338–40 (in Hebrew).

that provide certainty, one needs a rudimentary understanding of Aristotle's theory of proof and syllogistic. Consequently, Ibn Tibbon inserts into his biblical exegesis what is one of the earliest accounts of the syllogism in Hebrew.[114]

Joseph Ibn Kaspi informs us that it is impossible to understand Scripture without prior knowledge of grammar and logic; a correct understanding of logic enables one to investigate the secrets of the Torah. Kaspi's commentary on Esther is devoted entirely to a discussion of the law of contradiction.[115] Elsewhere he writes that the scriptural distinction between *ʾot* ("sign") and *mofet* ("demonstration") corresponds precisely to Aristotle's distinction in *Posterior Analytics* between proof that something exists and proof why something must exist as it does, that is, demonstration; in fact, the two words have the same meaning whether they are referring to logical proof or wonders. Hence,

> the foreign term for *peleʾ* is *mirabile*. God forbid that this should be the term for *mofet*, an error made by our teachers; rather its term is *demonstratio*, and the foreign term for *ʾot* is *signum*, like a mark or a signal.[116]

If some medieval Jewish intellectuals viewed Aristotelian logic as the key to unlocking Scripture, others saw it as the key to understanding talmudic reason. Some scholars analyzed the traditional hermeneutical principles that relate the Oral Law to the Written Law, as propounded in the *baraita de-Rabbi Ishmael*, in light of Aristotle's rules of inference. According to Hillel of Verona in thirteenth century,

> whoever understands what the Sages, of blessed memory, have to say regarding the thirteen rules by which the Torah is explicated, and whoever knows the ways of the syllogism in its various figures, and the ways of demonstration, will clearly know that the talmudic sages based all their inferences on the ways of syllogism and demonstration.[117]

Although this view never became widespread among Jewish philosophers, much less among commentators on the thirteen hermeneutical principles, a number of them argued that the principles can be understood in light of Aristotelian logic.

The most prominent of these is the Portuguese scholar David Ibn Bilia (first half of the fourteenth century), who in his commentary identifies each of the talmudic principles with a corresponding Aristotelian one.[118] Ibn Bilia was motivated to write his commentary because he had not found one by any of the Spanish sages, "perhaps because they thought that the talmudic Sages were not logicians (*al-nāṭiq* [*iyyūn*]), and that their methods in the talmudic 'give-and-take' were nothing more than disputational (*wikkuḥiyim*)."[119] Ibn Bilia also shows, from various passages in the Talmud, that the rabbis pronounced their rulings according to the art of logic. A somewhat different approach is taken by Isaac Polgar (Spain, fourteenth century), who concedes that the hermeneutical principles are not to

[114] See James T. Robinson, "Samuel Ibn Tibbon's Commentary on Ecclesiastes," Ph.D. dissertation, Harvard University, 2002. This includes a critical edition of the Hebrew text and selected translations. For the digression on logic, see pp. 309–13 (in English) and 574–6 (in Hebrew). For the background in logic and political philosophy, see pp. 99–132.

[115] Rosenberg, "Logic, Language, and Biblical Exegesis in the Writings of R. Joseph Ibn Kaspi," in M. Hallamish and A. Kasher, eds., *Dat we-śafah* (Tel Aviv: University Presses, 1981), pp. 105–15, on p. 107.

[116] Ibn Kaspi, *Šaršerot kesef*, s.v. *ʾot*, ibid., pp. 109–11.

[117] Cited in Aviram Ravitzky, "The Influence of Logic on the Understanding of the Methods of Halakhic Inference in the Middle Ages," Ph.D. dissertation, Hebrew University, 2005, p. 8.

[118] See Shalom Rosenberg, "The Commentary on the Thirteen Hermeneutical Principles by Rabbi David b. Yom Ṭov Ibn Bilia," *Alei Sefer* 18 (1995/6): 59–69 (in Hebrew). See Ravitzky, "The Influence of Logic," pp. 82–152. Ravitzky points out (pp. 162ff.) that some of Ibn Bilia's correlations are found in Moses of Narbonne's commentary on the *Intentions of the Philosophers*, mentioned earlier.

[119] Rosenberg, "The Commentary on the Thirteen Hermeneutical Principles," p. 62.

be identified with the methods of (scientific) demonstration but defends them against the criticisms of the pseudo-philosophers (*ha-mitpalsefim*) who slander the Torah and belittle the rabbinic explanations, stories, legends, and riddles. Other fourteenth-century philosophers, such as Moses of Narbonne and Gersonides, commented on the epistemic status of the hermeneutical rules; the latter claimed that they were never intended by the rabbis as rules of inference but only as mnemonic devices by which the rabbinic law could be associated with the scriptural verse. To replace them, Gersonides claims to have discovered topical rules of inferences (*meqomot*) by which the Oral Law is derived from the Written Law.[120]

If these philosophers tried to understand talmudic reasoning in light of logic, there are talmudists whose own books of principles and commentaries on the hermeneutical principles show the influence of logic. Aviram Ravitzky has argued that already in the early fourteenth century in Provence, the *Sefer Keritut* of Samson ben Isaac of Chinon employs logical terminology in the section on the thirteen hermeneutical rules; in the late fourteenth or early fifteenth century, the commentary by R. Abraham Elijah Cohen may be influenced by Scholastic logic, or, at least, by the Scholastic interest in *sophismata.* However, one has to wait until fifteenth-century Spain and the school of Isaac ben Jacob Canpanton (1360–1463) to see the full impact of Aristotelian logic (including some oblique references to Scholastic logic) in the formulation of works of talmudic methodology, such as books of principles (*sifrei kelalim*) and commentaries on the thirteen hermeneutical principles.[121]

[120] Commentary on the Torah, Introduction.

[121] On the methodology of Isaac Canpanton and his disciples, see Daniel Boyarin, *Ha-ʿIyyun ha-sefaradi* (Jerusalem: Ben-Zvi Institute for the Study of Oriental Jewry, 1988); idem, "Moslem, Christian, and Jewish Cultural Interaction in Sefardic Talmudic Interpretation," *Review of Rabbinic Judaism* 5 (2002): 1–33.

6

Astronomy among Jews in the Middle Ages

Bernard R. Goldstein

In the Middle Ages Jews were deeply involved in the practice of astronomy and they depended on the Greco-Arabic tradition largely based on Ptolemy's *Almagest* composed in the second century C.E. During the first phase, from about 750 to 1100, contributions by Jews, whether in Hebrew or Arabic, were relatively minor compared with those of their Muslim contemporaries.[1] However, in the second phase, beginning in Spain in the twelfth century, some significant works were translated from Arabic into Hebrew and others were summarized. In addition to the dominant Ptolemaic tradition, Jews had access to an astronomical tradition exemplified in Arabic by the tables of al-Khwārizmī (d. ca. 840) that ultimately derived from Hindu sources. Translations from Arabic into Hebrew continued in the thirteenth and fourteenth centuries and, by the end of the thirteenth century, enough material was available in Hebrew for Jews who did not know Arabic to compose original treatises that were more advanced than an introductory work. In addition to those writing in Arabic and in Hebrew, there was an important group under the patronage of Alfonso X, King of Castile (reigned 1252–84), that produced treatises in Castilian. The fourteenth century marks the third phase in which Jews made their most original contributions to astronomy, and this phase continued in the fifteenth century when Jews still excelled in this discipline by the standards of the day. In geographical terms, interest in astronomy can be found in nearly all Jewish communities, but the works produced in Spain and southern France were the most important.[2]

The evidence for Jewish involvement in astronomy is largely based on literary sources preserved in manuscripts, but there are some artifacts (notably astrolabes) and documents preserved in the Cairo Geniza that are now dispersed in various libraries. Other evidence comes from such community decisions as the ban on philosophy decreed in 1305 in Barcelona from which the study of astronomy was specifically excluded. The ban (or *ḥerem*) reads in part as follows:

From this day on and for the next 50 years, no member of our community shall study the "Greek" works on science or metaphysics, either in the original [i.e., in Arabic] or in translation, before he will

[1] See Bernard R. Goldstein, "Astronomy and the Jewish Community in Early Islam," *Aleph* 1 (2001): 17–57.

[2] Gad Freudenthal, "Science in the Medieval Jewish Culture of Southern France," *History of Science* 33 (1995): 23–58; Bernard R. Goldstein, "Scientific Traditions in Late Medieval Jewish Communities," in Gilbert Dahan, ed., *Les Juifs au regard de l'histoire: Mélanges en l'honneur de M. Bernhard Blumenkranz* (Paris: Picard, 1985), pp. 235–47. See also Y. Tzvi Langermann, "Arabic Writings in Hebrew Manuscripts: A Preliminary Relisting," *Arabic Sciences and Philosophy* 6 (1996): 137–60.

have reached the age of 25. . . . We have exempted from our decree the study of medicine, although it is a natural science, for the Torah has given the physician permission to practice the art of healing.

Even though it is not part of the decree itself, its main protagonist, Rabbi Solomon Ibn Adret, pointed out in a letter that "we have expressly exempted from the scope of the enactment the science of astronomy and all the works of Maimonides."[3] This decree is not known to have had much effect on the subjects studied in the Jewish community subsequent to 1305, but it does tell us that astronomy was held in high esteem at the time.

References to astronomy also appear in poems such as Ibn Gabirol's *Keter malḵut*, where the astronomical information was mostly based on the Arabic text of several chapters in the *Epistles of the Sincere Brethren* (*Rasāʾil Ikhwān al-Ṣafāʾ*); in a poem by Moses Ibn Ezra; and in two poems by Levi ben Gerson in praise of the instrument he invented, generally called the cross-staff (but which Levi referred to simply as the staff).[4] Of course, astronomical discussions also abound in medieval philosophical works.[5] Here, however, it is important to distinguish astronomical issues from cosmological concerns.

The main goal of medieval astronomers was to determine by computation the positions of the planets (including the Sun and the Moon) at any given time in the past or the future (there is no difference between past and future in this context) as well as the times of lunar and solar eclipses and their magnitudes. Generally, these computations depended on sets of tables constructed for this purpose, and these tables, in turn, were based on geometrical models for planetary motion. Often the tables were accompanied by instructions for their use without describing how their entries were determined. In some notable instances, however, there was considerable discussion of the underlying models and the observations that justified their parameters, in the style of Ptolemy's *Almagest*. Ptolemy wrote in Greek, and his magnum opus was translated into Arabic (and revised) several times, and then from Arabic into Hebrew by Jacob Anatoli (thirteenth century). Cosmology was not considered by Ptolemy in that book, but he presented his views in the *Planetary Hypotheses* (a work that only partially survives in the original Greek) that was translated into Arabic, and then from Arabic into Hebrew by Qalonymos ben Qalonymos (d. after 1328).[6] In this work Ptolemy determined the planetary distances and sizes based on the nesting hypothesis, namely that the orb of a planet (i.e., the spherical shell that encloses it whose center is the center of the Earth) is contiguous with the orb of the planet immediately below it. For example, with this hypothesis the minimum distance of Mercury is equal to the maximum distance of the Moon. Ptolemy's order of the planets according to their distances from the Earth is: Moon, Mercury, Venus, Sun, Mars, Jupiter, Saturn (followed by the orb of the fixed stars). This cosmological scheme was criticized by Maimonides in *Guide* Part II, chapter 24, and it was radically revised by Levi ben Gerson (d. 1344) in his lengthy work on astronomy that constitutes Book 5,

[3] Yitzhak Baer, *A History of the Jews in Christian Spain*, 2 vols. (Philadelphia: Jewish Publication Society, 1966), Vol. 1, pp. 301–2.

[4] Raphael Loewe, "Ibn Gabirol's Treatment of Sources in the *Kether Malkhut*," in Siegfried Stein and Raphael Loewe, eds., *Studies in Jewish Religious and Intellectual History presented to Alexander Altmann* (Tuscaloosa: University of Alabama Press, 1979) pp. 183–94; Adena Tanenbaum, "Nine Spheres or Ten? A Medieval Gloss on Moses Ibn Ezra's *Be-shem El Asher Amar*," *Journal of Jewish Studies* 47 (1996): 294–310; Bernard R. Goldstein, *The Astronomy of Levi ben Gerson (1288–1344)* (New York: Springer-Verlag, 1985), pp. 71–2, 157.

[5] For Saadia and Halevi see, e.g., Goldstein, "Astronomy . . . in Early Islam"; Y. Tzvi Langermann, "Saʿadya and the Sciences," in idem, *The Jews and the Sciences in the Middle Ages* (Aldershot: Ashgate, 1999), Essay II. For Maimonides, the literature is vast; but see, e.g., Y. Tzvi Langermann, "Maimonides and Astronomy: Some Further Reflections," in ibid., Essay IV.

[6] Bernard R. Goldstein, *The Arabic Version of Ptolemy's* Planetary Hypotheses (Philadelphia: American Philosophical Society, 1967). The Hebrew version is uniquely preserved in MS Paris, BNF Héb. 1028. On the life of Qalonymos ben Qalonymos, see Ernest Renan and Adolphe Neubauer, "Les écrivains juifs français du XIV[e] siècle," *Histoire Littéraire de la France* 31 (1893): 351–789, on pp. 417–24; repr. Westmead: Gregg, 1969.

Part 1, of his *Wars of the Lord*. However, most medieval treatises on astronomy by Jews (and others) omitted discussion of cosmological issues.

In terms of subject matter, Jewish scholars wrote on the whole range of topics treated by medieval astronomers and compiled tables for them: chronology and timekeeping, trigonometry, lunar and solar motion, planetary motion, star lists, and so on. Chronology, that is, dealing with different calendars and how to convert dates from one to another, was often discussed by medieval astronomers, although there were no ancient precedents available to them. Timekeeping, that is, finding the time of day or night by means of astronomical observations, was another concern. We tend to think of trigonometry as a branch of mathematics, but in the Middle Ages it was part of astronomy. The idea for tabulating the sines of angles had come from India to the Islamic world in the late eighth century and largely replaced the table of chords employed by Ptolemy for solving problems in plane and spherical trigonometry.

Lunar and solar motion received a lot of attention in treatises by Jews, and often astronomical tables in Hebrew are restricted to these motions to the exclusion of the planets. However, this may be misleading; for example, Immanuel Bonfils of Tarascon (mid-fourteenth century) compiled two sets of tables, one called *The Six Wings* for lunar and solar motion, and another for the motions of all the planets.[7] Special attention was devoted to lunar and solar eclipses, and tables were arranged for computing their times and magnitudes. Thus, Jacob ben David Bonjorn (also known as Jacob Poʿel; ca. 1360) compiled tables for true conjunctions and oppositions of the Sun with the Moon, as well as for solar and lunar eclipses, computed for the latitude of Perpignan. His tables are based on a thirty-one-year cycle and depend on Levi ben Gerson's tables.[8] Another variety of astronomical table is an almanac that gives planetary positions for specific dates, as opposed to auxiliary tables that may be used to compute positions for arbitrary dates. Noteworthy in this category is the almanac of Jacob ben Maḵir (also known as Prophatius Judaeus), who flourished from 1263 to 1300. This almanac was translated into Latin and consulted by the poet Dante (d. 1321), among others; it was printed in 1908 as Dante's *Almanac* because the editors were interested in Dante rather than in Jacob ben Maḵir, and they used Dante's own copy.[9] Star lists are sometimes short (with 20 to 40 bright stars), and sometimes long (with the 1,028 stars listed by Ptolemy in the *Almagest*). Each entry in such lists includes the star's name, its coordinates (celestial longitude and latitude), its magnitude (understood as its rank in size but, in fact, as we now know, magnitude is a measure of its rank in brightness), and occasionally other data. The coordinates are generally based on previous lists with no appeal to direct observation. The coordinate for celestial longitude of each star was usually updated to the current year by a fixed rule that applied to all the stars in the list, whereas the coordinate for celestial latitude remained unchanged because it does not vary with time.

Jews also described scientific instruments, some of which they had invented or modified. The most commonly described instrument in the Middle Ages was the astrolabe; in addition

7 For Bonfils, see Bernard R. Goldstein, "The Role of Science in the Jewish Community in Fourteenth Century France," *Annals of the New York Academy of Sciences* 314 (1978): 39–49, on pp. 46–7; José Chabás and Bernard R. Goldstein, *Astronomy in the Peninsula: Abraham Zacut and the Transition from Manuscript to Print* (Philadelphia: American Philosophical Society, 2000), pp. 108–9; David A. King and Julio Samsó, with a contribution by Bernard R. Goldstein, "Astronomical Handbooks and Tables from the Islamic World (750–1900): An Interim Report," *Suhayl* 2 (2001): 9–105, on p. 67; Peter Solon, "The Six Wings of Immanuel Bonfils and Michael Chrysokokkes," *Centaurus* 15 (1970): 1–20.

8 See José Chabás, "The Astronomical Tables of Jacob ben David Bonjorn," *Archive for History of Exact Sciences* 42 (1991): 279–314.

9 Giuseppe Boffito and Camillo Melzi d'Eril, *Almanach Dantis Aligherii sive Profhacii Judaei Montispessulani Almanach perpetuum* (Florence: Olschki, 1908).

to treatises, there are five extant examples inscribed in Hebrew characters.[10] An astrolabe has a front and back. The front displays a projection of the sky that allows for easy transformation of coordinates from one system to another, for example, from coordinates with respect to the local horizon to coordinates with respect to the ecliptic (the apparent path of the Sun in the sky), which were generally used for planetary positions. It may also be used to convert an observed position of the Sun or a star with respect to the local horizon to the time before or after noon or midnight. In this way the astrolabe functions as an analog computer, eliminating the need for extensive trigonometric computations. The back serves a number of purposes, including taking observations of the Sun during the day or of stars at night, but there are very few extant records of such observations. It is noteworthy that Levi ben Gerson described modifications of the astrolabe to improve its accuracy and reliability for making observations. One such improvement was the invention of a transversal scale that permitted very fine graduations of an arc.[11] A modified version of the astrolabe, known as the “new quadrant” or “quadrant of Israel,” was invented and described by Jacob ben Maḵir.[12] Furthermore, Levi ben Gerson invented several new observational instruments, including the aforementioned cross-staff, that were still being used by European astronomers in the seventeenth century.[13]

Astrology is often seen as indistinguishable from astronomy as it was practiced in the Middle Ages. However, it is clear that although some astronomers accepted astrology and were practitioners of this art, others opposed it, and still others simply ignored it. Each case deserves separate treatment, and sweeping generalizations are inappropriate. For details, another essay in this volume may be consulted.[14]

SPAIN

The astronomical tradition in Hebrew began in Spain in the twelfth century, and it is closely associated with Abraham Bar Ḥiyya and Abraham Ibn Ezra.

Abraham Bar Ḥiyya of Barcelona and Abraham Ibn Ezra brought Arabic astronomy to the attention of members of the Jewish community who were not literate in Arabic. Among other things, this required the formation of a new technical vocabulary. Bar Ḥiyya tended to use Arabic terms transliterated into Hebrew characters, whereas Ibn Ezra tended to give new meanings to biblical terms. For example, Bar Ḥiyya adopted the Arabic *markaz* (center), which became Hebrew *merkaz*, whereas for this purpose Ibn Ezra recycled the biblical term *muṣaq*, giving it an entirely new meaning. Bar Ḥiyya was heavily reliant on the *zij* (a set of astronomical tables with instructions or canons) by al-Battānī (d. 929), whose work was widely used in Spain, whereas Ibn Ezra appealed both to al-Battānī, who represented the Greek tradition, and to al-Khwārizmī, who represented the Indian tradition. Both astronomical traditions flourished in Islamic Spain. Bar Ḥiyya’s astronomical tables in Hebrew were largely drawn from those of al-Battānī, although Bar Ḥiyya arranged them for the Jewish calendar with its nineteen-year cycle, rather than for the calendars used by al-Battānī. Among the many astronomical works by Ibn Ezra is a translation into Hebrew of a lost Arabic commentary by Ibn al-Muthannā (tenth century) on the astronomical tables of al-Khwārizmī. Nonetheless, from the point of view of technical astronomy, neither Bar Ḥiyya

[10] Bernard R. Goldstein, “The Hebrew Astrolabe in the Adler Planetarium,” *Journal of Near Eastern Studies* 35 (1976): 251–60, on p. 251 n. 1.

[11] Goldstein, *Astronomy of Levi ben Gerson*, pp. 164–70.

[12] Moritz Steinschneider, *Mathematik bei den Juden*, 2nd ed. (Hildesheim: Georg Olms, 1964), pp. 111–13; John D. North, *Richard of Wallingford*, 3 vols. (Oxford: Clarendon Press, 1976), Vol. 2, p. 184, and Vol. 3, plate XI.

[13] See John J. Roche, “The Radius Astronomicus in England,” *Annals of Science* 38 (1981): 1–32.

[14] Shlomo Sela, “Astrology in Medieval Jewish Thought,” elsewhere in this volume.

nor Ibn Ezra was responsible for any innovations; rather, they transmitted knowledge of the traditions of Muslim Spain at a relatively elementary level.[15]

Both Bar Ḥiyya and Ibn Ezra compiled lists of bright stars based on Arabic sources that ultimately depended on Ptolemy's *Almagest.* Because it was assumed that the fixed stars all move together slowly about the poles of the celestial ecliptic (which is true to a first approximation), their positions depended on the date. In the case of Bar Ḥiyya the list of positions of some twenty-eight stars, with names in both Hebrew and Arabic, is given for 1104 CE, and he relied on the astronomical work of al-Battānī. Ibn Ezra has two versions of his list, one for 1146 C.E. with thirty-six stars, and the other for 1148 C.E. with twenty-three stars. This star list is related to an Arabic text by Ibn al-Zarqāllu, a prominent Muslim astronomer who lived in Spain in the eleventh century.[16]

Isaac ben Sid, a member of the team of astronomers under the patronage of Alfonso X of Castile, is best known for the Castilian version of the Alfonsine Tables (ca. 1270) for which he was the author (together with Judah ben Moses ha-Cohen). This team comprised a number of Jews along with some Christians, and the bulk of the work involved Jewish participants. Ben Sid's surviving works in Castilian are extensive, and he composed treatises on several scientific instruments. The Alfonsine Tables were translated into Latin and diffused from Paris, beginning in the 1320s, and they became the most widely consulted set of astronomical tables in the Latin West for well over two centuries. There are relatively few references to Ben Sid in Hebrew astronomical works, but he is mentioned by Judah ben Asher II (d. 1391) and by Abraham Zacut (d. 1515).[17]

PROVENCE

A great many Jewish astronomers flourished in Provence from the thirteenth to the fifteenth century, among them the translator Samuel ben Judah of Marseilles.[18] He was born in 1294, and his family had lived in Provence for at least 150 years prior to that time. In 1312, at the age of eighteen, he began his studies of philosophy and astronomy under the tutelage of a Jewish scholar at Salon-de-Provence. As we learn from a work he completed in 1324, Samuel traveled to Spain where he pursued his translational activities. But in 1329 he was back in Provence in Tarascon, and in 1330–1 he completed his first independent treatise, a commentary on the first three books of Ptolemy's *Almagest.* He then turned his attention to Arabic astronomical works produced in Spain, particularly the *Reparation of the Almagest* (*Iṣlāḥ al-Majisṭī*) by Jābir Ibn Aflaḥ (twelfth century). To locate a copy of the Arabic text, Samuel and his brother first went to Trinquetaille, near Arles. However, they had access to the text for only two days, and they returned to Tarascon with a very incomplete copy. Later, in Aix-en-Provence, Samuel discovered a previous Hebrew translation of Jābir's text by Jacob ben Makir, but he decided it was seriously deficient. Samuel then got a copy of the Arabic text he had seen a few years earlier in Trinquetaille; he completed his revision of the previous Hebrew translation in 1335. Jābir was a severe critic of Ptolemy, and his treatise was

[15] For Bar Ḥiyya, see, e.g., Y. Tzvi Langermann, "Science in the Jewish Communities of the Iberian Peninsula: An Interim Report," in idem, *The Jews and the Sciences*, Essay I, on pp. 10–16. For Ibn Ezra, see, e.g., Bernard R. Goldstein, "Arabic Astronomy and Astrology in the Works of Abraham Ibn Ezra," *Arabic Sciences and Philosophy* 6 (1996): 9–21; and Shlomo Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003).

[16] Bernard R. Goldstein, "Star Lists in Hebrew," *Centaurus* 28 (1985): 185–208.

[17] José Chabás and Bernard R. Goldstein, *The Alfonsine Tables of Toledo* (Dordrecht: Kluwer, 2003), pp. 4, 138, 226. For Judah ben Asher II, see Chabás and Goldstein, *Abraham Zacut*, pp. 49–50.

[18] Lawrence V. Berman, "Greek in Hebrew: Samuel ben Judah of Marseilles, Fourteenth-Century Philosopher and Translator," in Alexander Altmann, ed., *Jewish Medieval and Renaissance Studies* (Cambridge, MA: Harvard University Press, 1967), pp. 289–320.

influential in the original Arabic as well as in Latin and in Hebrew translations (the Latin translation was printed in Nuremberg in 1534). Some of the works translated by Samuel do not survive in the original Arabic and thus are of great importance for reconstructing several key episodes in the history of astronomy. For example, he translated a treatise on twilight by the Spanish-Muslim astronomer Ibn Muʿādh (eleventh century) in which the height of the atmosphere was estimated to be about 50 miles (in units in which the circumference of the Earth was taken to be 24,000 miles), a value that was widely accepted until the seventeenth century. Samuel's last dated activity was in 1340, and he probably died shortly thereafter.[19]

Let us next consider the achievements of Levi ben Gerson of Orange, the most talented Jewish astronomer in the Middle Ages. His family name in Latin is given as "de Balneolis," but research in local archives suggests that, whereas an ancestor resided in Bagnols-sur-Cèze in Languedoc, Levi was probably born in Orange. Little is known about his life except that he occasionally traveled to nearby Avignon, for he says explicitly that some of his astronomical observations were made there. He was a prolific writer who composed many biblical commentaries and several philosophical works. For our purposes, though, his treatises on astronomy are the most important. Curiously, his main astronomical work was incorporated into a long philosophical work as Book 5, Part 1, of his *Wars of the Lord*. However, his *Astronomy* is an independent text that is extant in manuscripts distinct from those that survive of his philosophical work. It is divided into 136 chapters that fill over 200 folios in manuscript – and only a small portion of this work has been published or translated into a modern language. There was also a medieval Latin translation made with Levi's participation by a certain cleric, Peter of Alessandria, Italy, who is otherwise unknown. In 1342 a short version of the Latin text was dedicated to Pope Clement VI, who resided in Avignon. Levi's *Astronomy* had not been completed at the time of his death, for there are internal indications of revisions, and in all surviving manuscripts we find blank spaces – and even a few missing chapters – where he may have intended to insert further revisions.[20]

As already mentioned, Ptolemy's *Almagest* was the foundation for most of medieval astronomy, and Levi was certainly dependent on Ptolemy. Nevertheless, Levi organized his *Astronomy* in a completely new fashion, and he set his goals in a philosophical context. After some preliminary matters, Levi turned to trigonometry and the determination of entries in a table for the sines of angles, which were standard topics in medieval astronomy. However, the next topic, astronomical instruments, was placed more prominently than in other comparable texts of the time. In these chapters he discussed the cross-staff that he claimed to have invented, the camera obscura, and the astrolabe. Significantly, Levi gave a correct explanation for the workings of the camera obscura that eluded astronomers, ignorant of Levi's work, until Kepler arrived at essentially the same explanation at the beginning of the seventeenth century.

Levi then discussed the range of phenomena that an astronomical theory must take into consideration. Unlike Ptolemy and his followers, whose theories only depended on positional data, Levi said that physical data also have to be taken into account. In particular, he reported observations of the variation in the brightness of Mars at successive oppositions (when Mars come closest to the Earth), and he compared its brightness with that of Saturn. Before the invention of the telescope, size and brightness of planets and stars were not

[19] Bernard R. Goldstein, "Ibn Muʿâdh's Treatise on Twilight and the Height of the Atmosphere," *Archive for History of Exact Sciences* 17 (1977): 97–118; A. Mark Smith and Bernard R. Goldstein, "The Medieval Hebrew and Italian Versions of Ibn Muʿâdh's 'On Twilight and the Rising of Clouds,'" *Nuncius* 8 (1993): 611–43.

[20] Bernard R. Goldstein, *Levi ben Gerson's Astronomical Tables* (Hamden, CT: Archon Books, 1974), pp. 74–83; idem, *Astronomy of Levi ben Gerson*; José Luis Mancha, "The Latin Translation of Levi ben Gerson's *Astronomy*," in Gad Freudenthal, ed., *Studies on Gersonides: A Fourteenth-Century Jewish Philosopher-Scientist* (Leiden: Brill, 1992), pp. 21–46.

distinguished, and Levi (together with all medieval astronomers) assumed that a brighter celestial object had a greater angular size. As far as I can tell, no one before Kepler, other than Levi, unambiguously mentions this variation at opposition, although the difference in the size or brightness of Mars at apogee and perigee was occasionally noted. Levi also treated the phases of Venus in detail and argued that they ought to be visible if Venus received its light from the Sun. But, in the absence of such phases, he concluded that Venus must be self-luminous.[21] Again, it was only with the telescope that Galileo was able to discern phases of Venus for the first time. In the case of the Moon, Levi took issue with Ptolemy's account of the lunar distances that follow from his final lunar model, for it required that the Moon be twice as large in diameter at quadrature (half-Moon phase) than at opposition (full Moon), contrary to what is observed. Although one would expect this comment to be widespread, I am not aware of anyone before Levi making it. Later in the fourteenth century the same criticism of Ptolemy was voiced by Ibn al-Shāṭir, a Muslim astronomer in Damascus, and in the fifteenth century it was mentioned by Regiomontanus. Levi also appealed to the spots on the Moon (commonly called the Man in the Moon) to argue that we only see one lunar face, from which he concluded that an epicyclic model for lunar motion is impossible because it implies we should see both lunar faces (i.e., the front and the back of the Moon). Here again, Levi departed from Ptolemy on the basis of observation, arguing that, although the eccentric and epicyclic models are equivalent mathematically, they have different physical consequences.[22]

In his long discussion of alternative models for planetary motion Levi considered various arrangements of the three centers that Ptolemy used in his models, namely the Earth, the center of the deferent (a circle on which the center of the epicycle is located), and the equant (about which uniform motion takes place). Note that the path of a planet in three dimensions was not considered before Kepler (who coined the term "orbit" for this path), and Levi was no exception in this respect. Levi then appealed to the principle of the uniformity of nature to argue that the absence of an epicycle for the Moon means that there are no epicycles for the planets either. By way of contrast, Ptolemy's planetary models had both eccentric circles and epicycles. Levi constructed several lunar models and produced a table for one of them. The transformation of a geometric model to a table for computing positions without requiring trigonometric solutions of triangles had already been done by Ptolemy for his models, but Levi had to use somewhat different techniques because his model was very different from Ptolemy's. In the case of the five planets, Levi's tables do not survive, and the chapters on planetary models are incomplete.

Levi used his instruments to make precise observations of planetary and lunar positions. In the case of the Moon he compared various models to see how well they accounted for these observed positions, and he argued that his new lunar model was significantly more successful than Ptolemy's. It should be emphasized that Levi compared his own observations with various models whereas in the Middle Ages it was much more common to determine the success of an alternative to Ptolemy's models by assessing how well it accounted for Ptolemy's observations (rather than those made by the author). This means that Levi had greater confidence in his own observations than was generally true for his contemporaries.

[21] Bernard R. Goldstein, "Levi ben Gerson and the Brightness of Mars," *Journal for the History of Astronomy* 27 (1996): 297–300; idem, "The Pre-Telescopic Treatment of the Phases and Apparent Size of Venus," *Journal for the History of Astronomy* 27 (1996): 1–12.

[22] Bernard R. Goldstein, "The Physical Astronomy of Levi ben Gerson," *Perspectives on Science* 5 (1997): 1–30; Alan Gabbey, "Innovation and Continuity in the History of Astronomy: The Case of the Rotating Moon," in Peter Barker and Roger Ariew, eds., *Revolution and Continuity: Essays in the History and Philosophy of Early Modern Science* (Washington, D.C.: Catholic University of America Press, 1991), pp. 95–129, on pp. 112–20.

Levi records over eighty specifically dated astronomical observations, many more than any of his contemporaries (Christian, Muslim, or Jewish).[23]

Levi did not casually depart from Ptolemy's models:

> When deciding to dissent from the teachings of the ancients, one should do so with extreme care and scrutiny, deviating from these teachings as little as possible. This is appropriate because the ancients were lovers of truth and endeavored to approach it as closely as possible even when their principles prevented them from reaching it entirely. . . . Therefore we first tried to solve some of the difficulties raised against Ptolemy by our predecessors with respect to his postulates concerning eccentric spheres and epicycles, seeking to find observational evidence to establish his hypotheses. . . . When we investigated this matter for the Moon and found that the model could not possibly be as Ptolemy postulated, we took pains to investigate alternative possibilities for the models of the celestial bodies until we discovered a model according to which the motions of these bodies conform to observational evidence.[24]

Levi's views on cosmic dimensions differed significantly from those of his predecessors and contemporaries. Although he accepted Ptolemy's nesting hypothesis, he interpreted it in an unusual way, invoking a principle taken from the motion of fluids. For Ptolemy, adjacent planetary orbs are treated as contiguous with no empty space between them. In contrast, according to Levi, the planetary orbs are separated by a fluid that has the property of moving with the motion of the orb below it at its lower boundary. The motion of layers in the fluid then diminishes according to their distance from the center of the Earth until a layer is reached where it is zero, and then the motion of subsequent layers begins to increase until at its upper boundary it reaches the motion of the orb above it. The thickness of the fluid layer between each pair of planetary orbs is determined by a procedure involving successive approximations, and this led Levi to increase the size of the universe considerably from Ptolemy's 20,000 terrestrial radii for the distance from the Earth to the fixed stars.[25]

ITALY

There are also indications that astronomy attracted the attention of Jews in Italy. For example, a manuscript in Florence contains a Hebrew translation of an introductory work in Arabic by al-Kharaqī (d. 1138/9), *Kitāb al-tabṣīra*, by Nathan ha-Meʾati (i.e., Nathan from the city of Cento; thirteenth century).[26] This translator is otherwise known for his medical rather than astronomical interests. The most significant Jewish astronomer in Italy was Mordecai Finzi, who lived in Mantua in the fifteenth century. His translations from Latin include a set of astronomical tables by an Englishman, William Batecombe (fourteenth century), originally for the city of Oxford. In the middle of the fifteenth century Bartolomeo Manfredi of Mantua composed a treatise in Italian, only extant in a Hebrew translation by Finzi, that describes a geared instrument called *celidario*. This instrument belongs to the category of

[23] Bernard R. Goldstein, "Medieval Observations of Solar and Lunar Eclipses," *Archives Internationales d'Histoire des Sciences* 29 (1979): 101–56; idem, "A New Set of Fourteenth Century Planetary Observations," *Proceedings of the American Philosophical Society* 132 (1988): 371–99; José Luis Mancha, "Gersonides' Astronomical Work: Chronology and Christian Context," in Colette Sirat, Sara Klein-Braslavy, and Olga Weijers, eds., *Les méthodes de travail de Gersonide et le maniement du savoir chez les scolastiques* (Paris: Vrin, 2003), pp. 39–58, on pp. 55–7.

[24] Goldstein, "Planetary Observations," p. 385. See also Bernard R. Goldstein, "Levi ben Gerson on the Sources of Error in Astronomy," *Aleph* 10 (2010): 211–40.

[25] Bernard R. Goldstein, "Levi ben Gerson's Theory of Planetary Distances," *Centaurus* 29 (1986): 272–313; José Luis Mancha, "Heuristic Reasoning: Approximation Procedures in Levi ben Gerson's Astronomy," *Archive for History of Exact Sciences* 52 (1998): 13–50, on pp. 34–9.

[26] Bernard R. Goldstein, "The Survival of Arabic Astronomy in Hebrew," *Journal for the History of Arabic Science* 3 (1979): 31–9, on p. 31; idem, "Scientific Traditions in Late Medieval Jewish Communities," p. 238.

equatoria, that is, devices for determining planetary positions without recourse to numerical computation. Many such devices were described in Latin in the Middle Ages, but only a few in Hebrew.[27]

In Sicily it seems that the astronomical tradition began with the arrival of Isaac Ibn al-Aḥdab (or al-Ḥadib) from Spain at the end of the fourteenth century. Among his compositions is a set of astronomical tables for the Sun and the Moon called *ʾOraḥ selulah* in which he mentions both Jewish and Muslim predecessors.[28] As a sign of its popularity, Abraham Gascon (Cairo, ca. 1540) wrote a commentary on Ibn al-Aḥdab's set of tables. Ibn al-Aḥdab also composed a treatise on an *equatorium* to represent Ptolemy's planetary models, which begins as follows:

> Finding the true positions of the seven planets [the five planets plus the Sun and the Moon] . . . involves difficulty and effort in the [use of] all the different kinds of tables that have been composed for these purposes that cannot be avoided. . . . Moreover, errors affect the results . . . because of the multitude of operations, sometimes to be added and sometimes to be subtracted. . . . Many have tried to construct instruments to simplify this as was done for the Sun on [the back of] the astrolabe. . . . But these instruments came with lengthy instructions and could only be used with great difficulty. [Such is the case] with the instrument ascribed to al-Zarqāllu, and other [instruments invented] by Christian scholars. . . . In the year 5156 AM [i.e., 1396 CE] in Syracuse on the island of Sicily . . . I invented an instrument that is easy to construct and it is accurate to a degree [of longitude].[29]

It is not known if anyone actually constructed such an instrument according to Ibn al-Aḥdab's instructions that form the bulk of this treatise.

THE LATE PHASE: JUDAH BEN VERGA AND ABRAHAM ZACUT

The vibrant Jewish tradition in astronomy lapsed at the end of the fifteenth century, and no Jewish astronomer from that time until the emancipation met contemporary standards for practitioners of astronomy. There were two outstanding Jewish astronomers in the late fifteenth century in the Iberian peninsula: Judah ben Verga of Lisbon, Portugal, who was active between 1455 and 1475, and Abraham Zacut (1452–1515), who spent his most creative years as an astronomer in Salamanca, Spain – but, after the expulsion from Spain in 1492, he moved to Portugal, and then to North Africa, Jerusalem, and Damascus.

Judah ben Verga's Hebrew treatises have only recently begun to be studied, and none of his astronomical works have been published. He wrote a treatise on an astronomical instrument that he called *ha-keli ha-ʾofqi* (the horizontal instrument), and among the observations he recorded is one he made at Lisbon of an autumnal equinox in 1456. Judah mentioned a number of Jewish predecessors in astronomy, including Abraham Ibn Ezra and Levi ben Gerson. His most important work is a set of astronomical tables, *Ḥuqot šamayim* (Ordinances of the Heavens: cf. Job 38:33), and it has a number of unusual features.[30]

[27] Bernard R. Goldstein, "Descriptions of Astronomical Instruments in Hebrew," in David A. King and George Saliba, eds., *Essays in Honor of E. S. Kennedy* (New York: New York Academy of Sciences,1987), pp. 105–41, on pp. 120–1. On Finzi, see Y. Tzvi Langermann, "The Scientific Writings of Mordekai Finzi," *Italia* (1988): 7–44; repr. in idem, *The Jews and the Sciences*, Essay IX.

[28] Bernard R. Goldstein and José Chabás, "Isaac Ibn al-Ḥadib and Flavius Mithridates: The Diffusion of an Iberian Astronomical Tradition in the Late Middle Ages," *Journal for the History of Astronomy* 37 (2006): 147–72.

[29] Goldstein, "Descriptions of Astronomical Instruments," p. 128.

[30] Bernard R. Goldstein, "The Astronomical Tables of Judah ben Verga," *Suhayl* 2 (2001): 227–89; idem, "Preliminary Remarks on Judah ben Verga's Contributions to Astronomy," pp. 63–90 in Luís Saraiva and Henrique Leitão, eds., *The Practice of Mathematics in Portugal* (Coimbra: Coimbra University Press, 2004); Y. Tzvi Langermann, "Science in the Jewish Communities of the Iberian Peninsula," pp. 19–34.

Zacut's main astronomical work is a *zij* in Hebrew called *ha-Ḥibbur ha-gadol* (The Great Composition). Despite claims in secondary sources that Zacut taught at the University of Salamanca, this has no basis in fact and derives from the dedication to an unnamed bishop of Salamanca in the Latin version of the 1496 edition of the *Almanach Perpetuum* that includes the astronomical tables compiled by Zacut in his *Ḥibbur*.[31] This dedication was simply lifted almost verbatim from a dedication by Regiomontanus (d. 1476) to a bishop in Hungary in a work published in 1490 (and there is no Hebrew version of it). It is now clear that Zacut had nothing to do with the edition of 1496 and never refers to it in his subsequent writings. In contrast, the *Ḥibbur* is clearly addressed to a Jewish audience with references to Maimonides and the Talmud that are missing in the published Latin text. Indeed, Zacut's canons to his *Ḥibbur* bear little resemblance to those in the *Almanach Perpetuum*. In particular, Zacut refers mainly to Jewish astronomers such as Levi ben Gerson, Jacob ben David Bonjorn, Judah ben Verga, and Judah ben Asher II of Burgos, the great-grandson of Asher ben Yehiel (d. 1328), a refugee from Cologne who became the chief rabbi of Toledo. Judah ben Asher II has often been confused with Judah, the son of Asher ben Yehiel, who died in 1349. An astronomical treatise by Judah ben Asher II has only recently been identified in a Hebrew manuscript at the Vatican.[32]

Among Zacut's innovations are some astronomical tables with base-30 notation for numbers rather than the usual base-60 notation used by astronomers (including Zacut himself) or base-10 notation that is familiar to us today. Zacut argued for consistency because the zodiac is divided into twelve equal signs of 30°, but I know of no one after him who accepted this notation.[33] His tables are mostly in the form of almanacs, that is, planetary positions for specific dates, beginning in 1473. The positions themselves were computed accurately with the Parisian version of the Alfonsine Tables. Although he generally used the Christian calendar, there are a few tables in the *Ḥibbur* based on the Jewish calendar with years counted from the Creation. However, in Jerusalem, where he lived in 1513, Zacut constructed a new set of tables for the Jewish calendar that is only extant in fragments. In the sixteenth and seventeenth centuries Zacut was considered an authority on astronomy in the Jewish communities of Palestine, Syria, and Iraq.[34] Zacut has often been associated with the voyages of discovery undertaken by Portuguese sailors, but there is no contemporary documentation to support these claims that only go back to the mid-sixteenth century. In fact, Zacut made very few astronomical observations (they can be counted on the fingers of one hand!), and he had little to say about astronomical instruments in any of his treatises. It is difficult to imagine that an experienced navigator would consult someone who had lived far from the sea with no specific expert knowledge to impart.[35]

In a reversal of the usual pattern, the Spanish version of the *Almanach Perpetuum* (with Zacut's tables) was translated into Arabic in North Africa in the early seventeenth century by Aḥmad b. Qāsim al-Ḥajarī (d. after 1641) who had lived in Seville before arriving in Morocco around 1600. This Arabic version survives in a number of manuscripts in European libraries as well as in Morocco and Egypt. Moreover, Moses Galiano (or Galeano), who was active in

[31] For Zacut's relations with Christian scholars, see José Chabás, "Interactions Between Jewish and Christian Astronomers in the Iberian Peninsula," elsewhere in this volume.

[32] Bernard R. Goldstein, "Astronomy in the Medieval Spanish Jewish Community," in Lodi Nauta and Arjo Vanderjagt, eds., *Between Demonstration and Imagination: Essays in the History of Science and Philosophy Presented to John D. North* (Leiden: Brill, 1999), pp. 225–41, on pp. 235–6.

[33] Bernard R. Goldstein, "Abraham Zacut and the Medieval Hebrew Astronomical Tradition," *Journal for the History of Astronomy* 29 (1998): 177–86, on p. 181.

[34] Bernard R. Goldstein, "The Hebrew Astronomical Tradition: New Sources," *Isis* 72 (1981): 237–51, on pp. 245–6.

[35] Chabás and Goldstein, *Abraham Zacut*, pp. 9–11.

the Jewish community of Istanbul, produced an Arabic adaptation of the *Almanach Perpetuum* in 1506/7.[36]

CONCLUDING REMARKS

It is well to consider a few issues for further research in addition to the obvious need for editions of key texts with translation and commentary. Allusions to astronomy can be found in many literary genres, and they should be explored. For example, there is no adequate survey of scientific discussions that appear in halakhic (legal) contexts. Moreover, the Karaites did not accept the Rabbanite rules for computing the calendar and insisted on direct observation. Their contributions to astronomy remain to be elucidated.[37] The Karaite scholar Caleb Afendopolo (1464?–1525) was the owner of the oldest extant manuscript of Levi ben Gerson's *Astronomy*, and he himself executed a copy of the Hebrew version of Jābir Ibn Aflaḥ's *Restoration of Astronomy* (both preserved in the Bibliothèque nationale de France).[38] In fact, Caleb was an astronomer in his own right but, as far as I know, his scientific works have attracted little attention.[39] The kabbalists are another group whose references to scientific issues are not well documented in the secondary literature. For example, Ḥayyim Vital, a noted kabbalist (d. 1620), wrote an introduction to astronomy that is thoroughly medieval in content (he cites Zacut among others); it was printed (in part) in Jerusalem in 1866 for the traditional Jewish community there.[40] Moreover, astronomical (and astrological) considerations sometimes entered into Messianic speculations, and this was the case for Abraham Zacut, among others. Already in the twelfth century Maimonides attacked such speculation in his *Epistle to Yemen* (without mentioning any specific authors except for Saadia), and earlier in the twelfth century Abraham Bar Ḥiyya had written on the End of Days according to the Book of Daniel as well as according to astrological (and astronomical) theory.[41]

In sum, it should be stressed that interest in astronomy, by intellectuals with a variety of commitments, is in evidence in virtually all medieval Jewish communities.

[36] Ibid., pp. 170–1; Julio Samsó, "Abraham Zacut and José Vizinho's *Almanach Perpetuum* in Arabic (16th–19th C.)," *Centaurus* 46 (2004): 82–97; Y. Tzvi Langermann, "A Compendium of Renaissance Science: *Taʿalumot ḥoḵmah* by Moses Galeano," *Aleph* 7 (2007): 285–318.

[37] For an overview, see Daniel Lasker, "Science in the Karaite Communities," in this volume.

[38] Goldstein, *Tables of Levi ben Gerson*, pp. 74–5.

[39] See, e.g., Caleb Afendopolo, *Sefer Miḵlal yofi*, ed. Yosef Elgamil (Ashdod: Meḵon tif'eret Yosef, 2002).

[40] Goldstein, "New Sources," p. 245.

[41] Bernard R. Goldstein and David Pingree, "Horoscopes from the Cairo Geniza," *Journal of Near Eastern Studies* 36 (1977): 113–44, on pp. 114–15; idem, *Levi ben Gerson's Prognostication for the Conjunction of 1345* (Philadelphia: American Philosophical Society, 1990); Chabás and Goldstein, *Abraham Zacut*, pp. 15, 173–4.

7

Interactions between Jewish and Christian Astronomers in the Iberian Peninsula

José Chabás

In the Iberian Peninsula, the sciences, especially astronomy, were a meeting ground for Muslim, Christian, and Jewish scholars during the Middle Ages, to the point that it is sometimes impossible to separate the works of members of the different communities. In the Late Middle Ages, from the twelfth to the fifteenth centuries, the activities of Christian scholars became increasingly significant, and their interactions with Jewish scientists living in the same territory became increasingly varied. In this chapter, it is argued that astronomers of the two faiths collaborated in many different ways and that intellectual collaboration in astronomy was maintained even at times of rampant religious intolerance. These relationships were chiefly personal, rather than institutional, and their intensity varied according to the social and political conditions of the time. There are many examples of these working relationships, but this chapter focuses on four episodes, which differ in nature and took place in different centuries.

SCIENTIFIC TRANSLATION

The first example of collaboration, which occurred in the twelfth century, belongs to the domain of scientific translation. The main characters are two learned scholars, the Jew, Abraham Bar Ḥiyya, and the Christian, Plato of Tivoli.

Plato of Tivoli, also known as Plato Tiburtinus, was presumably from Italy, but he worked in Barcelona in the first half of the twelfth century. He is known as the translator, from Arabic and Hebrew into Latin, of several treatises on astronomy and mathematics, some of them deriving from Greek texts of Classical Antiquity.[1] For instance, Plato was the first to translate Ptolemy into Latin. In October 1138 he rendered into Latin the Arabic version of Ptolemy's *Tetrabiblos* by Ḥunayn Ibn Isḥāq (ca. 900). The result, known as the *Quadripartitum,* had an enormous success in the Late Middle Ages and Renaissance and was already in print in 1484, shortly after the invention of the printing press. According to Clagett, Plato was also responsible for the first translation from Arabic into Latin of a work by Archimedes, the *Measurement of the Circle.*[2] Soon after, however, the famous Gerardus Cremonensis (d. 1187)

[1] Lorenzo Minio-Paluello, "Plato of Tivoli," in Charles C. Gillispie, ed., *Dictionary of Scientific Biography* (New York: Scribner, 1981), Vol. 11, pp. 31–3.

[2] Marshall Clagett, "The Impact of Archimedes on Medieval Science," *Isis* 20 (1956): 419–29.

I would like to thank Bernard R. Goldstein for the continual interaction and exchange of comments that led to the writing of this chapter and Gad Freudenthal for his suggestions on its final version.

produced his own translation of that work, which is considered to be more faithful to the original text.

Plato translated astronomical treatises by Muslim scholars as well; they include the *Almansoris iudicia seu propositiones* by, or dedicated to, Yaḥyā Ibn Abi Manṣūr (ninth century). The translation was finished in 1136 and was widely disseminated, judging from the great number of manuscripts and editions (more than fifty) that have been preserved. Plato is also credited with translating into Latin a treatise on geomancy, the *Liber arenalis scientiae*, but the manuscripts containing this text do not make it clear whether the original language was Arabic or Hebrew.[3]

Plato also translated into Latin a treatise in Hebrew on geometry and trigonometry by Abraham Bar Ḥiyya, a mathematician and polymath who was probably born in Soria (Spain) but worked in Barcelona in the first half of the twelfth century. He was known as "Savasorda," a Romance derivation of an Arabic title indicating that he held a position in the local administration. Abraham Bar Ḥiyya is the author of several books on astronomy and mathematics written in Hebrew,[4] including the *Treatise on Measurement and Calculation* (1116), which is based on Arabic sources. Plato translated this book into Latin, probably in 1145, and it was later known in Christian Europe as the *Liber embadorum* (Book of Areas).[5]

However, Plato of Tivoli's relationship with Abraham Bar Ḥiyya was not limited to that between a translator and an author. They collaborated intensively on a number of works, probably using the so-called two-step technique of translation or four-hands translation,[6] that is, a system involving two translators, one (in this case, Abraham) from Arabic into a vernacular (Romance) language and another (Plato) from the vernacular into Latin. (Modern scholars assume that the vernacular version was only oral and not written down.) In this event, it is appropriate to consider both scholars as translators of Abraham's work.

Abraham Bar Ḥiyya used Arabic material in his own works in Hebrew and helped Plato as well as other scholars translate scientific books from Arabic into Latin. According to d'Alverny, Abraham "must have helped Plato both with interpreting the language and understanding mathematics and astronomy, especially al-Battānī."[7] Indeed, Abraham adapted and translated into Hebrew the canons to the zij of al-Battānī; this work, edited by Millás, was probably finished in Barcelona by April 1136.[8] The Latin translation of this text, too, must be considered the result of close collaboration between Plato of Tivoli and Abraham Bar Ḥiyya.

This collaborative process characterized other translation projects, such as the treatise on the astrolabe by the Andalusian Ibn al-Ṣaffār (eleventh century), among other Muslim authors, and also the *Spherics* by Theodosius, through an Arabic translation by Qusta Ibn

3 Geomancy is a method of divination, frequently used by Muslim practitioners, to explain the past and present and predict the future by interpreting various figures, each composed of four rows of points. For the manuscripts containing Plato's translation, see Thérèse Charmasson, *Recherches sur une technique divinatoire: la géomancie dans l'Occident médiéval* (Geneva: Droz and H. Champion, 1980).

4 On Abraham Bar Ḥiyya, see José M. Millás Vallicrosa, *Estudios sobre historia de la ciencia española* (Barcelona: Consejo Superior de Investigaciones Científicas, 1949), pp. 219–62. In the 1950s Millás Vallicrosa edited various scientific treatises by Bar Ḥiyya.

5 See M. Curtze, "Der *Liber Embadorum* des Savasorda in der Übersetzung des Plato von Tivoli," *Abhandlungen zur Geschichte der Mathematischen Wissenschaften* 12 (1902): 3–183.

6 Marie-Thérèse d'Alverny, "Les traductions à deux interprètes, d'arabe en langue vernaculaire et de langue vernaculaire en latin," in G. Contamine, ed., *Traduction et traducteurs au moyen âge* (Paris: CNRS, 1989), pp. 193–206.

7 Marie-Thérèse d'Alverny, "Translations and Translators," in Robert L. Benson and Giles Constable, eds., *Renaissance and Renewal in the Twelfth Century* (Cambridge: Harvard University Press, 1982), pp. 421–62, esp. pp. 450–1.

8 José M. Millás Vallicrosa, *La obra* Séfer Ḥesbón maḥlekot ha-kokabim *de R. Abraham bar Ḥiyya ha-Bargeloní* (Barcelona: Consejo Superior de Investigaciones Científicas, 1959).

Luqa (ninth century). As was often the case, many translators working in the twelfth century in the Iberian peninsula were in contact with one other and praised one another's works. Indeed, Plato of Tivoli was a friend of another translator of Arabic texts into Latin, John, son of David (probably a Jew), to whom he dedicated his translation of Ibn al-Ṣaffār's treatise.

As is well known, shortly after this first generation of translators in Barcelona and the Ebro Valley, Toledo became a major center for the translation of scientific texts into Latin during part of the thirteenth century. Other examples of interaction between Jewish and Christian scholars in the field of astronomy took place in Toledo. For instance, in 1217 the famous translator, Michael Scot, rendered into Latin a treatise by al-Biṭrūjī, *De motibus celorum*, with the help of a certain "Abuteus Levita," a Jew about whom nothing else is known. Michael Scot later worked on translations in Sicily, at the court of Frederick II, where he collaborated with a Provençal Jew, Jacob Anatoli.[9] Also in Toledo, in 1218, a canon of Padua by the name of Salio translated some astrological texts in collaboration with a learned Jew called David. In the second half of the thirteenth century, Jacob ben Makhir Ibn Tibbon, an astronomer and translator active in southern France, collaborated with John of Brescia on the translation into Latin of a treatise on a special type of astrolabe, the *Azafea*, originally written by the eleventh-century Toledan astronomer Azarquiel.

In most of these cases of open collaboration and two-step translation – those in which the names of both collaborators are mentioned in the Latin translation – it is difficult to distinguish between the contributions of the two translators. Nevertheless, all these cases show that cultural diversity was a driving force, and these joint enterprises made a significant contribution to the diffusion of scientific knowledge across linguistic and religious boundaries in the Iberian Peninsula.

ORIGINAL WORKS OF ASTRONOMY IN A MULTICULTURAL MILIEU

Our second episode of interaction between Jewish and Christian astronomers comes from Castile, in the second half of the thirteenth century, during the reign of Alfonso the Wise, king of Castile and León (1252–84). This period is most relevant for its scientific endeavors; Alfonso's patronage marked a turning point in the development of astronomy outside al-Andalus, in Latin Christendom.[10] For the first time, original astronomical works began to predominate over translations, which had previously been the main activity in the field. However, that did not mean that translation disappeared.

To carry out his program of making astronomy available in the vernacular, Alfonso surrounded himself with a group of scientific collaborators. We know the names of fifteen of these scholars, including five Jews. Two of the Jewish scholars, Isaac ben Sid and Judah ben Moses ha-Cohen, were probably in the service of King Alfonso on a permanent basis. Judah, who was also a physician, had already been in the service of Alfonso's father, Ferdinand III (who reigned from 1217 to 1252), and had translated a treatise by Azarquiel, originally in Arabic, into Latin for him.

Alfonso's Jewish scholars played a prominent role in the scientific activities of the court; they participated in twenty-three of the thirty scientific works sponsored by the king. These works were for the most part original, whereas others were translations from Arabic. In some cases the Jewish scholars did their work in partnership, mostly with Christian scholars; there are many examples of translations or revisions of texts produced by a Jew and a non-Jew in collaboration. Within this group of scholars, Isaac ben Sid and Judah ben Moses ha-Cohen were the most active, being involved in eleven and seven works, respectively.

9 See d'Alverny, "Les traductions à deux interprètes," p. 198.

10 See José Chabás and Bernard R. Goldstein, *The Alfonsine Tables of Toledo* (Dordrecht: Kluwer, 2003).

As for the impact on later astronomy, the most outstanding achievement of the group of scholars sponsored by Alfonso X was the *Libro de las tablas alfonsies*, written by Isaac and Judah in collaboration. This book consisted of a set of astronomical tables and a text explaining their use. Unfortunately, the original tables have not reached us, and only the explanatory text survives, in a uniquely preserved manuscript in Castilian. The Latin adaptation of this book circulated throughout Christian Europe, starting in Paris in the 1320s, and became the main computing tool used by European astronomers for several centuries.

Isaac ben Sid, one of the two authors of the *Libro de las tablas alfonsies*, was the key figure among the royal scholars. His other achievements included authorship of various treatises in Castilian on the construction and use of astronomical instruments and clocks and careful observations of lunar and solar eclipses, which have been preserved.

The other three Jewish scholars played a less prominent role in the collective effort under the patronage of Alfonso X. Don Abraham, also called Abraham of Toledo, has been identified as Abraham ben Waqār, who later served as court physician to Alfonso's son, Sancho IV. Abraham was responsible for the translation of two works from Arabic into Castilian. Another Jewish court scholar was Samuel ha-Levi, the author of a book in Castilian on clocks and the reviser of the Castilian version of al-Ṣūfī's star catalogue. Finally, we know the name of yet another scholar, "don Xosse" (or Mosse), who was referred to as *nuestro alfaquim* (our physician), but his identity is still unresolved.

It is worth noting that Isaac ben Sid and Judah ben Moses ha-Cohen, as did Abraham and Samuel, wrote on astronomy in Castilian, the language of their Christian king and patron. In fact, Isaac and Judah were the first scholars to write on scientific subjects in Castilian, and to do so they had to create a new scientific language and a new scientific terminology, much as Abraham Bar Ḥiyya had done more than a century earlier in Hebrew. Despite the fact that Isaac and Judah were the heirs of a long astronomical tradition in Arabic that had developed in al-Andalus in the previous centuries, their astronomical terminology had its linguistic roots in Latin.

In this second episode, we have a group of scholars of different faiths, working individually or in partnership on a program probably set up by themselves and sponsored by the king. This intense collaboration required a special status for non-Christian scholars, differing from that assigned by law to the Jewish and Muslim communities.

The fact that Jewish scientists in the service of the king had the same status as other scholars could lead us to believe that cooperation and tolerance were the general rule. However, this was not the case, as can be readily seen from the *Siete Partidas*, a legal text compiled at Alfonso's behest containing the laws governing the status of religious minorities in Castile, which touched many aspects of everyday life. This legislation was not benevolent toward these minorities, to the extent that some modern scholars consider that "cohabitation of the three faiths [in the peninsula] consisted in avoiding all possible contact" and that "tolerance exhibited by the majority depended on the silence and docility of minorities."[11]

ROYAL PATRONAGE IN ARAGON

For the third episode, we move forward one century, to Aragon during the long reign (1336–87) of Pere el Cerimoniós (the Ceremonious), also known as Peter IV of Aragon, Peter III of Catalonia, and Peter II of Valencia, among other names. Like Alfonso of Castile, he had a considerable interest in science, particularly astronomy. We know the names of two Christian

[11] Marjorie Ratcliffe, "Judíos y musulmanes en las *Siete Partidas* de Alfonso X," in J. C. de Miguel, A. Muñoz, and C. Segura, eds., *Alfonso X el Sabio, Vida, Obra y Época* (Madrid: Sociedad Española de Estudios Medievales, 1989), pp. 237–49.

astronomers in his service, Pere Gilbert and his student Dalmau Ses Planes, who were the authors of an almanac based on observations. Unfortunately, only the canons explaining how to use the almanac survive, in a partial copy in Latin.[12] Although these two scholars seem to have been based permanently at the court, the model of patronage developed by King Pere did not have as wide a range as Alfonso's in Castile in the previous century. For more complex works, King Pere summoned other astronomers to court. One of them, Jacob ben Abi Abraham Isaac al-Corsuno, wrote an Arabic treatise on the astrolabe while he was living in Seville in 1375–6, after which he moved to Barcelona. Several royal documents dated 1380, which explain his duties at the court, are extant in the royal archives of Aragon. Jacob was the main compiler of the *Tables of Barcelona*, which were based on work by another astronomer from Seville, Ibn al-Kammād (twelfth century), who in turn was a follower of Azarquiel.[13]

The most influential astronomical work of the period in the Iberian Peninsula was by another Jew who was also in the service of the crown, although also not on a permanent basis. The document that attests to that collaboration, now housed in the royal archives of Aragon, refers to Jacob ben David Bonjorn, the compiler of a set of tables for the latitude of his city, Perpignan (now in southern France, but then ruled by Aragon), whom it calls "Jew of the king's house." Bonjorn's tables, originally written in Hebrew, give the time of true syzygies (conjunctions and oppositions of the Sun and the Moon) for thirty-one consecutive years beginning in 1361, as well as the positions of the luminaries at syzygy and the circumstances of eclipses during that period.[14] Bonjorn's tables are based on those of another Jewish scholar, Levi ben Gerson (d. 1344), who lived in Orange in southern France.[15] Jacob ben David Bonjorn's tables have survived in many manuscripts in Latin, Hebrew, Catalan, and Greek and were used extensively by both Christian and Jewish astronomers in the fifteenth century.

Before turning to the next episode, it should be stressed that the cases of Jewish scholars like Jacob Corsuno and Jacob ben David Bonjorn, who worked for Pere el Cerimoniós, were far from isolated. The Catalan archives of the time provide many other examples of Jewish scientists and craftsmen employed by the court.[16] For example, in 1352 the king urgently requested Bonjorn's father to send him a "table for the astrolabe" he was supposed to compile. Another relative of Bonjorn, Naçan del Barri, constructed quadrants and astrolabes for the court in 1356. And of course there was Cresques Abraham, the leading mapmaker of Mallorca, who supplied the king with maps of the world, including the impressive "Catalan Atlas," dated 1375, which King Pere subsequently gave as a gift to the king of France and today is one of the treasures at the Bibliothèque nationale de France.

As we have seen, during the reign of Pere, there were continuous and deep relationships between the royal court and various Jewish scholars and craftsmen. This interaction was mainly based on patronage. Yet, unlike the situation under Alfonso of Castile – with his

[12] José M. Millás Vallicrosa, *Las Tablas Astronómicas del Rey Don Pedro el Ceremonioso* (Madrid: Consejo Superior de Investigaciones Científicas, 1962).

[13] See ibid.; José Chabás, "Astronomía andalusí en Cataluña: las Tablas de Barcelona," in Josep Casulleras and Julio Samsó, eds., *From Baghdad to Barcelona: Studies in the Islamic Exact Sciences in Honour of Prof. Juan Vernet* (Barcelona: Universitat de Barcelona, 1996), pp. 477–525. On Ibn al-Kammād, see J. Chabás and B. R. Goldstein, "Andalusian Astronomy: *al-Zîj al-Muqtabis* of Ibn al-Kammâd," *Archive for History of Exact Sciences* 48 (1994): 1–41.

[14] José Chabás, *L'astronomia de Jacob ben David Bonjorn* (Barcelona: Institut d'Estudis Catalans, 1992).

[15] Bernard R. Goldstein, *The Astronomical Tables of Levi ben Gerson* (Hamden: Archon Books, 1974).

[16] On the cultural documents in the royal archives of Aragon (the Arxiu de la Corona d'Aragó), see Antoni Rubió i Lluch, *Documents per l'història de la cultura catalana mig-eval*, 2 vols. (Barcelona: Institut d'Estudis Catalans, 1908 and 1921); Amada López de Meneses, "Documentos culturales de Pedro el Ceremonioso," *Estudios de Edad Media de la Corona de Aragón* 5 (1952): 669–771.

scientific scriptorium and Jewish astronomers working on a permanent basis and interacting with other scholars at the court – King Pere summoned and protected his Jewish scholars only for specific purposes, probably because he did not have a long-term program to create a corpus of astronomical works in Catalan.

JEWISH–CHRISTIAN COLLABORATION AT THE EVE OF THE EXPULSION

We now turn to the second half of the fifteenth century, a difficult period for the Jewish communities in Spain, which culminated in their expulsion in 1492. At this time we find an example of a different sort of collaboration, involving neither patronage nor joint translation, between Christian and Jewish scholars in the field of astronomy.

Around 1460, the University of Salamanca established a chair of astronomy/astrology, probably the first one in the Iberian Peninsula. Its first incumbent was Nicholaus Polonius, who, as his name indicates, probably came from Poland. He is the author of a text and set of astronomical tables written for his students at the university and based on the *Tabulae Resolutae*, a particular form of presenting the Alfonsine Tables that was quite popular in the fifteenth century among astronomers in Central Europe, especially in Poland.[17]

The most outstanding astronomer of the time, Abraham Zacut, was born in 1452 in Salamanca, where he studied, but little is known about his teachers in scientific subjects. It is safe to say, however, that he did not attend the famous university in his hometown. Although he is best known for his astronomical activity, Zacut was interested in other matters as well, such as history and lexicography, on which he wrote several treatises. His first book on astronomy, *ha-Ḥibbur ha-gadol* (The Great Compilation), was written in Hebrew for a Jewish audience; it contains many astronomical tables.[18] These tables were computed for Salamanca and have 1473 as their epoch, even though Zacut finished his work around 1478. In the text Zacut mentions many Jewish astronomers by name, in addition to several ancient authors, such as Menelaus and Ptolemy, as well as the Muslim astronomer Azarquiel. The only Christian mentioned is Alfonso the Wise, after whom Zacut adds the names of that king's two main patron scholars: Isaac ben Sid and Judah ben Moses ha-Cohen.

That Zacut maintained close relations with the astronomers working in Salamanca, within or outside its university, is indicated in many ways. Many of his astronomical tables are based on the Alfonsine Tables, which reached Salamanca in the 1460s via Nicholaus Polonius; some of Zacut's tables are closely related to those in Latin manuscripts produced in Salamanca that are part of the Alfonsine corpus, ultimately derived from the work sponsored by King Alfonso the Wise. Zacut was also in touch with the Christian astronomers at the University of Salamanca; in 1481, Juan de Salaya, who had held the chair of astronomy between 1464 and 1469, translated Zacut's *Ḥibbur* into Castilian. In the uniquely preserved manuscript containing this Castilian text, still at the University of Salamanca, we read that the translation was made "with the help of Zacut himself." This indicates close collaboration between a Jew and a Christian, in a difficult time and at a difficult place, only a decade before the expulsion of the Jews by the rulers of Spain. To give a hint of the difficulties that Jews might face in the academic milieu of Salamanca, in 1459 Alonso de Espina, the head of the Colegio de San Francisco at the University of Salamanca, advanced a set of theses that were later used

[17] José Chabás, "Astronomy in Salamanca in the Mid-fifteenth Century: The *Tabulae Resolutae*," *Journal for the History of Astronomy* 29 (1998): 167–75; Beatriz Porres and José Chabás, "Los cánones de las *Tabulae Resolutae* para Salamanca: origen y transmisión," *Cronos* 1 (1998): 51–83.

[18] Francisco Cantera Burgos, "El judío salmantino Abraham Zacut," *Revista de la Academia de Ciencias Exactas, Físicas y Naturales de Madrid* 27 (1931): 63–398; idem, *Abraham Zacut* (Madrid: M. Aguilar, 1935). For a recent survey of Zacut's astronomical activity, see José Chabás and Bernard R. Goldstein, *Astronomy in the Iberian Peninsula: Abraham Zacut and the Transition from Manuscript to Print* (Philadelphia: American Philosophical Society, 2000).

to justify the Spanish Inquisition. In particular, in his *Fortalitum Fidei* (Strength of the Faith) he accused Jews, Muslims, and especially *conversos* of all kinds of crimes.[19]

Zacut's tables are based not only on the Alfonsine corpus, largely reworked by Christians, but also on tables compiled by Jewish astronomers. For instance, Zacut's tables for the syzygies are based on those of Jacob ben David Bonjorn, to whom Zacut repeatedly gives credit in his text.

In 1486 Zacut was no longer in Salamanca, but in Gata, in Extremadura, south of Salamanca. There he composed a short book entitled *Tratado breve en las ynfluencias del cielo* (Short Treatise on the Influences of the Heaven), soon followed by one on solar and lunar eclipses (*De los eclipses del sol y la luna*). In both texts, which survive only in Castilian, Zacut mentions his patron at the time, Juan de Zúñiga y Pimentel (d. 1504), master of the Order of Alcántara; in the second text, Zacut refers to Juan de Zúñiga as "my lord." Zúñiga was interested in a wide range of disciplines and had called to his local court many eminent scholars, such as the famous humanist and grammarian Elio Antonio de Nebrija (1444–1522); it seems likely that Zacut met some of these scholars there.

After the expulsion of the Jews in 1492, Zacut entered the service of the king of Portugal. Zacut's tables were published in 1496 in Leiria (Portugal) under the title *Almanach Perpetuum*. A certain Joseph Vizinus, who described himself as a disciple of Zacut, added a new text to the printed edition. All or some of the tables were reprinted in Venice in 1498, 1502, 1525, and 1528, indicating that this book was appreciated and had become part of the astronomical tradition. Examples of the use of Zacut's tables by Christian scholars abound.

Similarly appreciated was the work of Diego de Torres, another astronomer, who held the chair of astronomy at the University of Salamanca around 1485. He wrote a treatise on medical astrology based on a solar eclipse that occurred on March 16, 1485, and was reported to be total in Salamanca. The data used in this treatise seem to have been taken directly from Zacut's *Ḥibbur*, but without credit to its author.

Although neither Zacut nor his Christian peers openly acknowledged each other's work, a careful examination reveals the existence of such mutual influences. This stands in contrast to the open collaboration between Jewish and Christian scholars in earlier centuries, which is mentioned explicitly in the relevant texts.

As already noted, Zacut used Jacob ben David Bonjorn's tables and acknowledged this borrowing in his *Ḥibbur*. Yet he was not the only one to use these tables. Around 1485, a Christian scholar of Barcelona, Bernat de Granollachs, composed a work called *Lunari* that had immense success and was reprinted many times. Its list of syzygies is taken directly from Bonjorn's tables, but Bonjorn is not mentioned in the short prefatory text.[20] In 1485 it was probably considered safer not to mention in print the name of any Jew.

CONCLUSION

The Iberian Peninsula thus provides many examples of interactions between Jews and Christians in the field of astronomy. I reviewed four such episodes here. First came translation, which required a collaborative effort among scholars with different cultural backgrounds and linguistic skills. Collaboration also extended to other aspects of astronomical activity, with

[19] Enrique Esperabé de Arteaga, *Historia pragmática e interna de la Universidad de Salamanca* (Salamanca: F. Núñez Izquierdo, 1914); see also Águeda M. Rodríguez Cruz, *El oficio de rector en la Universidad de Salamanca y en las universidades hispanoamericanas* (Salamanca: Universidad de Salamanca, 1979).

[20] José Chabás and Antoni Roca, *El "Lunari" de Bernat de Granollachs. Alguns aspectes de la història de l'astronomia a la Catalunya del Quatre-cents* (Barcelona: Fundació Salvador Vives i Casajuana, 1985); José Chabás and Antoni Roca, "Early Printing of Astronomy: The *Lunari* of Bernat de Granollachs," *Centaurus* 40 (1998): 124–34.

scholars displaying a thorough knowledge of the scientific work by others. When it came to the composition of original treatises or astronomical tables, the interactions between Jewish and Christian astronomers were much more complex: Sometimes the patronage of Christian rulers played an essential role in bringing together scientists of both faiths; sometimes the scientists collaborated directly, borrowing or appropriating one another's results and theories. Many Christian and Jewish astronomers worked together, openly or silently, to develop a single discipline, astronomy. They probably felt that, whether in close collaboration or in isolation, they were contributing to the same body of knowledge, but sometimes it is almost impossible to distinguish between the contributions of one or another of them.

From these episodes it is clear that medieval astronomy, as practiced by Jewish and Christian scholars in the Iberian Peninsula, cannot be separated into "Christian astronomy" and "Jewish astronomy." Rather, astronomy in the Iberian Peninsula was an activity of universal interest and has to be regarded as a meeting ground – or a "neutral zone," as Goldstein has put it[21] – for scholars of different faiths.

[21] Bernard R. Goldstein, "Science as a 'Neutral Zone' for Interreligious Cooperation," *Early Science and Medicine* 7 (2002): 290–1 and 302–5.

8

The Hebrew Mathematics Culture (Twelfth–Sixteenth Centuries)

Tony Lévy

In this chapter, I provide a definition of Hebrew mathematical culture, an overview of the periods and persons of medieval Hebrew mathematics, a survey of the bodies of knowledge of Hebrew mathematics, and a discussion of the notion of "Hebrew mathematics."

DEFINITION AND SCOPE

I apply the term "Hebrew mathematical text" to any text or work whose language is Hebrew and whose content is strictly mathematical. This narrow definition excludes astronomy (apart from some relevant mathematical sections), astrology, and calendar calculations. Two other groups of texts that I do not consider are the biblical and rabbinic literature and mathematical texts written by Jewish scholars in Arabic.

The arithmetical or geometrical passages in the biblical and rabbinic literature (notably the Mishnah and Talmud) are certainly Hebrew mathematics; however, they are relatively sparse and unsystematic and have a meaning only in the context of the problems (practical, legal, liturgical) that inspired them.[1] One could certainly attempt to attach this material to the traditions of Babylonian or Egyptian mathematics or even to specific Greek traditions. Yet I must underscore that the corpus of writings in which we are interested here – the first mathematical writings in Hebrew to be considered date from the twelfth century – are not a development of this knowledge, although it was also presented in Hebrew (and sometimes in Aramaic). It is important to emphasize this discontinuity of nature and not only of form that distinguishes rabbinic mathematics from the medieval texts to be considered. Yet, as historians have pointed out, medieval Jewish scholars themselves went out of their way to emphasize the continuity between these two bodies of knowledge as a means of legitimizing their own scientific activity: Doing so allowed them to find a place for the profane sciences within the context of the community culture, the essential glue and guarantor of the continuity of the Jewish culture. Similarly, the medieval Hebrew mathematical vocabulary (see the later discussion on Abraham bar Ḥiyya and Abraham Ibn Ezra) was created by exploiting linguistic resources available in the ancient texts.[2]

I also leave out a significant group of texts that attest to mathematical activity within the medieval Jewish world. These are mathematical texts and commentaries written in Arabic

[1] Sarfatti 1968, §§16–79.
[2] Sarfatti 1968.

(often in Hebrew characters) by Jewish authors, such as Saadia Gaon al-Fayyūmī[3] and Dūnash ibn Tamīm al-Qarawī in the tenth century, and Maimonides[4] and Ibn ʿAknin[5] in the twelfth century.[6] Although these works are part of the history of Arabic mathematics, they affected the orientation of the scientific and educational activities of their Hebrew-speaking successors. Among these works we can distinguish two strands: (1) the strictly scientific treatises written by Jewish scholars, which are part of the tradition of Arabic mathematics, and (2) works, scientific or otherwise, that tackle scientific questions in the context of specifically Jewish philosophy, education, and theology. Although we do not have systematic lists, it would seem that works of the second category were translated or adapted into Hebrew much more frequently than were those of the first and therefore are directly relevant to our topic.

Two examples illustrate this pattern. In the tenth century, Dūnash Ibn Tamīm of Kairouan wrote works of mathematics and astronomy (for example, on the Indian system of calculation) in Arabic; a long treatise on the astrolabe has come down to us.[7] Yet only his philosophical-scientific commentary on the mystical Hebrew cosmological work *Sefer Yeṣirah* was translated from Arabic into Hebrew.[8] Maimonides wrote *Notes on Apollonius' Conics*,[9] but we know of no Hebrew version of this mathematical text, and Hebrew biographical and bibliographical sources do not mention it. Even those medieval Jewish authors who were passionately interested in the asymptotic nature of the hyperbola were unaware of the existence of this work by the great master. By contrast, Maimonides' mathematical philosophy and his notion of the status of mathematics, as developed in various works, exerted a considerable influence on Hebrew-speaking scholars in the thirteenth and fourteenth centuries.[10]

Finally, what were the links between mathematics and astronomy? It seems trivial to mention that for medieval scholars astronomy was the first of the "mathematical sciences" and that the scholars writing on mathematics were often astronomers as well. Inasmuch as "Hebrew astronomy" included a number of texts of theoretical astronomy, the needs of "the science of the stars" (think about research associated with calendrical problems) ipso facto triggered the need to master geometry in Hebrew. By the same token and more generally, astronomy legitimized scientific study and research. Maimonides' case is typical: His mastery of astronomy, manifested so brilliantly in his rabbinical work on the calendar (the "Sanctification of the New Moon"), was vigorously defended as legitimate by arguing that it illuminates the demands of the Law.[11]

The scope of this chapter is thus different from and more limited than *Mathematik bei den Juden*, the title of Moritz Steinschneider's famous series of papers, which are still an invaluable source to any scholar concerned with our field.

Medieval Hebrew Mathematics (Twelfth–Sixteenth Centuries): An Overview of Periods and Persons

Hebrew mathematical literature took off toward the end of the eleventh century in Europe. Its initial development from the twelfth to fourteenth century took place in the Jewish communities that were interested in the Judeo-Arabic culture of Spain but that lacked (or no

[3] Gandz 1943.
[4] Langermann 1984a; Lévy 2004; Rashed 2004.
[5] Güdemann 1873, pp. 1–62.
[6] We should add that Arabic bibliographers commend Jewish scholars, or persons so designated, for their mathematical skills and activity. See Poznanski 1905.
[7] Stern 1956.
[8] Vajda 1947–54, 2002.
[9] Langermann 1984a; Rashed 2004.
[10] Freudenthal 1993, pp. 113–17; 1995, pp. 36–8.
[11] Lévy 2004.

longer had) direct access to works in Arabic: These communities were located in northeastern Spain and southern France. During this initial phase, one can see the emergence of a basic mathematical culture (general works on arithmetic and geometry, scientific encyclopedias) and a set of texts meant for the educated public. The latter were derived almost exclusively from Arabic mathematical works. In Renaissance Italy, during the fifteenth and sixteenth centuries, Latin or vernacular sources gradually became more influential. In that same period, the increasing interest in the sciences shown by Judeo-Byzantine communities was also nourished by Arabic and Greek sources.

Prelude: *Mišnat ha-Middot* (The Book of Measurements): Witness of an Early Oriental Tradition?

Certainly the oldest mathematical work written in Hebrew, this short treatise belongs to the genre of practical geometry; its last part consists of numerical commentaries connected with the dimensions of the Tabernacle, as described in the biblical text.[12] We are still unable to specify the date and place of composition and author of this work, despite S. Gandz's suggestion of the second century.[13] It may even date from the ninth to twelfth centuries; perhaps it was written in Baghdad, and perhaps the author was an Arabic-speaking Jewish scholar who wanted to expose the world of traditional studies to scientific knowledge. Y. T. Langermann has recently advanced a hypothesis that seems fruitful in the historical perspectives it opens and the future research it invites: This mathematical treatise is part of a small set of works with a scientific character written in Hebrew in the East in the eighth or ninth century and thus represents the very first chapter of Hebrew scientific literature.[14] It should be remembered that *Mišnat ha-Middot* was almost unknown to medieval Jewish scholars and was discovered only in the nineteenth century.

The Birth of a Hebrew Scientific Language and Literature in Twelfth-Century Spain

Two figures dominate this era: Abraham bar Ḥiyya (ca. 1065–1136) and Abraham Ibn Ezra (ca. 1090–1167).

Abraham bar Ḥiyya (known in Latin as "Savasorda") received his scientific training in one of the Arabic principalities that rose on the ruins of the Cordova caliphate, almost certainly in Saragossa under the Banu Hūd (1039–1118); there were several famous scholars there. However, it was in Christian-ruled Barcelona that he wrote his original works in Hebrew, responding to an urgent request by Jewish notables from Provence; there he also collaborated with Plato of Tivoli in the translation of several Arabic works into Latin.[15] Abraham bar Ḥiyya wrote in Hebrew on philosophy, astronomy, and astrology. We know of two mathematical works by him: a scientific encyclopedia[16] and a work of practical geometry[17] that was translated into Latin by Plato of Tivoli in 1145.[18] In his various works, Bar Ḥiyya notes his recourse to Arabic sources, insists on his scrupulous respect for these sources, and admits that his works have no ambition to innovate but merely to transfer Arabic science into Hebrew. However, if we look more closely, we may note that he modified the objectives of the works he relied on so as to place the transferred content within the compass of

12 For the most recent edition of the text, see Sarfatti 1993.
13 Gandz 1932.
14 Langermann 2002.
15 Lévy 2001b.
16 Millás-Vallicrosa 1952.
17 Guttmann 1912; Millás i Vallicrosa 1931; Lévy 2001b.
18 Curtze 1902.

Hebrew-speaking readers in Provence. Yet Bar Ḥiyya's greatest achievement is doubtless the creation of a Hebrew mathematical language, much of which survives in modern Hebrew.

Abraham Ibn Ezra was born in Christian Spain, in Tudela (Navarre). Immersed in Arabic culture and probably with some knowledge of Latin as well, he left Spain when he was about fifty years old and spent the rest of his life moving through Europe. Poet, biblical commentator, grammarian, and astronomer, he also wrote an astrological encyclopedia that became widely known in medieval Europe thanks to translations of it.[19] His treatise on arithmetic, *Sefer ha-Mispar*, immediately served as a reference work and exerted a lasting influence: It is the root of a Hebrew arithmetical tradition whose history can be followed down to the work of the same name by Elijah Mizraḥi (1534).[20] Ibn Ezra is also probably the author of a recently identified treatise on practical geometry and arithmetic, *Sefer ha-Middot*, which was rendered into Latin in the twelfth century.[21] Ibn Ezra, too, forged a new scientific language, different from that of his older contemporary Bar Ḥiyya in being closer to biblical Hebrew (Bar Ḥiyya favored rabbinic Hebrew) and more remote from Arabic terminology and expressions.

The First Translations of Classical Texts (Thirteenth and Fourteenth Centuries)

In Provence the Ibn Tibbon family, originally from Granada, laid the foundations for the emergence of a true Hebrew scientific culture. Its third and fourth generations produced the translators of mathematical and astronomical texts. Over the course of a century or so (1230–1350), there emerged "the mathematics bookshelf of the medieval Jewish scholar,"[22] a corpus of texts whose core consisted of the major works of Greek mathematics, supplemented by Arabic commentaries or original works. This corpus can be classified as follows:

- Euclid and the Euclidean tradition
- spherical geometry
- the *Almagest* and the Ptolemaic tradition
- arithmetic and number theory
- algebra
- Archimedes and the Archimedean tradition
- Apollonius and the Apollonian tradition

The most important translators were Jacob Anatoli (ca. 1194–1256), who worked in Naples at the court of Frederick II; Moses Ibn Tibbon of Montpellier (ca. 1195–1274); Jacob ben Makhir Ibn Tibbon (Don Profeit Tibbon; ca. 1236–1305), an astronomer in Montpellier; Qalonymos ben Qalonymos (Maestro Calo) of Arles (1287–after 1329); and Samuel ben Judah (Miles Bongodas) of Marseilles (1294–ca. 1340). Some can be described as "professional translators" (e.g., Moses Ibn Tibbon). Jacob ben Makhir wrote original astronomical treatises; Qalonymos ben Qalonymos was employed at the court of Robert II of Anjou.

Two Fourteenth-Century Provençal Mathematician-Astronomers

Translation activity did not come to a screeching halt in the middle of the fourteenth century; neither was it limited geographically to the Provençal centers we have mentioned: Arabic scientific texts continued to circulate among Jewish scholars in Christian Spain, in

[19] Sela 1999, 2003.
[20] Silberberg 1895; Langermann and Simonson 2000; Lévy 2000b, 2001a.
[21] Lévy and Burnett 2006.
[22] Lévy 1997c.

Toledo, Saragossa, Burgos, and Salamanca and were studied or translated there. Although the original compositions written in Provence in the fourteenth century depended on the "classical" texts that were now available in Hebrew, their authors clearly made use of other sources that have only partially been identified; there are indeed good reasons to believe that the history of Andalusian mathematics is not yet sufficiently well known.

The two most prominent authors were famous astronomers. Levi ben Gershom, known as Gersonides (1288–1344), was the author of a considerable body of astronomical work[23] that was translated into Latin.[24] His mathematical writings on harmonic numbers,[25] combinatorial arithmetic,[26] and Euclidean geometry[27] suggest the possibility that he had some knowledge, undoubtedly indirect, of unidentified Arabic or Latin sources that were not available in Hebrew versions or adaptations.

Immanuel ben Jacob Bonfils of Tarascon (fl. 1340–65) was also an astronomer; his astronomical tables are known in Latin and in Byzantine Greek. His command of Latin seems to have been sufficient for him to translate the *Alexander romance* into Hebrew.[28] We know of several collections of his writings on arithmetic[29] and geometry.[30] In addition to Arabic texts previously adapted or translated into Hebrew, Immanuel ben Jacob may have known relevant texts directly from the Latin mathematical tradition.

Translations and Commentaries in Fifteenth-Century Italy

Fifteenth-century Italy witnessed an increasingly frequent recourse to Latin and the vernacular.

Mordecai (Angelo) Finzi of Mantua (d. 1475) was one of the most representative figures of this age. Astronomer, translator, and commentator, Finzi copied, translated, or adapted several mathematical texts.[31] His name is associated with an ambitious eleven-part summa of geometry that mentions Campanus and Jordanus Nemorarius.[32] He wrote a book on stereometry, the *Treatise on Measurement of Buckets and Barrels*, which mentions both Abraham bar Ḥiyya and Christian calculators.[33]

In the realm of algebra, we know of a work dedicated to Finzi by one of his friends, Simon ben Moses ben Simon Moṭot, which deals with the canonical equations of the second degree as well as with equations that can be reduced to them. This work, written in the 1460s, shows clear traces of Fibonacci's *Liber abaci*, as well as the works of the Italian "abacists" of the fourteenth and fifteenth centuries.[34] Finzi himself revised and annotated an earlier Hebrew version (now lost), based on Arabic and Spanish sources, of the *Algebra* of Abu Kāmil (ninth century),[35] including the second part on the pentagon and decagon[36] and the third part on indeterminate equations.[37] Finzi also translated (1473) from Italian an algebra text by

23 Goldstein 1992.
24 Mancha 1992, 1997.
25 Chemla and Pahaut 1992; Meyer and Wicker 2000.
26 Lange 1909; Simonson 2000.
27 Langermann 1966, pp. 45–6; Lévy 1992a, 1992b.
28 Lévi 1881.
29 Gandz 1936; Lévy 2003.
30 Rabinovitch 1974.
31 Langermann 1988; Lacerenza 2003.
32 Steinschneider 1893–1901, p. 194.
33 Langermann 1988, pp. 32–3.
34 Sacerdote 1892–4; Lévy 2007.
35 Lévy 2007.
36 Sacerdote 1896.
37 The third part has come down to us in Latin only in a short fragment; see Sesiano 1993, pp. 447–52.

Maestro Dardi of Pisa (1344), which deals with 198 different types of equations, including four irreducible cubic and quartic equations.[38]

It is possible that contacts between Jewish scholarly circles in Italy and in Constantinople, especially after the Ottoman conquest in 1453, provided channels for the diffusion of ideas and texts that originated in the Arabic East.

Mathematics in the Judeo-Byzantine Scholarly World (Fifteenth–Sixteenth Centuries)

In the fifteenth and first half of the sixteenth centuries, there was a renewed interest in mathematics and astronomy in the Judeo-Byzantine communities. Copying was widespread: Many precious codices containing mathematical texts were produced by copyists active in Constantinople in this age, clearly responding to a demand.[39] Compilations were also in vogue; we know a large anonymous commentary on Euclid's *Elements*, which mentions al-Kindī, al-Fārābī, Ibn al-Haytham, and al-Anṭakī alongside Greek authors. Books were still being translated from Arabic; around 1460, Shalom ben Joseph Anavi produced an annotated Hebrew translation of an Arabic text by Kūshyār Ibn Labbān on Indian mathematics.[40] There was also original writing, drawing on a triple heritage: texts available in Hebrew (Abraham bar Ḥiyya, Abraham Ibn Ezra; Greek and Arabic texts translated into Hebrew, Gersonides), Arabic texts not available in Hebrew, and Greco-Byzantine texts.

Mordecai Komtino (1402–82) was the author of *Sefer ha-Ḥešbon we-ha-middot*,[41] which bears the marks of ancient Greek sources such as Hero of Alexandria, as well as of methods expounded by Byzantine writers of the thirteenth and fourteenth centuries.[42]

Elijah Mizraḥi (1455?–1526), Komtino's student and successor as chief rabbi of Constantinople, offers evidence of a vast scientific culture and a strong interest in pedagogy in his *Sefer ha-Mispar*.[43]

Caleb Afendopulo (1460?–1525?), the spiritual leader of the prosperous Karaite community of Constantinople, was another of Komtino's students. Afendopulo, a prolific copyist and commentator, also wrote on astronomy and mathematics. His extensive commentary on Nicomachus's *Introduction to Arithmetic* has come down to us. It was not the only work of this genre produced in Constantinople in those years.[44]

The works mentioned in the last two sections have not yet received the attention they deserve. In particular, the development of Hebrew mathematics in Italy in the fifteenth and sixteenth centuries, whose sources are no longer merely Arabic but also Latin and vernacular, is still poorly appreciated. Moreover, the effects of the cultural context and of the evolution of the Jewish communities on the works of these mathematicians cannot be evaluated until those texts have been properly edited and analyzed. We are better informed about the scope of the major movement that developed in Provence in the thirteenth and fourteenth centuries.

38 Van Egmond 1983; Hughes 1987; Lévy 2007.

39 The expulsion of the Jews from Spain in 1492 propelled a stream of formerly Spanish families into the Ottoman Empire, and especially Constantinople. In 1499 a scholar of that city who was also a prolific copyist, Caleb Afendopulo, noted that several mathematical manuscripts had become available to him thanks to the arrival of exiles from Spain; see Steinschneider 1896, p. 93.

40 Levey and Petruck 1965.

41 Silberberg 1905–6.

42 Schub 1932.

43 Mizrahi 1534; Wertheim 1896.

44 Steinschneider 1894, pp. 76–7; Steinschneider 1896.

BODIES OF MATHEMATICAL KNOWLEDGE IN HEBREW

This section highlights the problems of the transmission and acculturation of Arabic mathematics in the Hebrew-speaking world; it covers translations and adaptations executed between 1230 and 1350, most of them in Provence. So as not to be limited to a survey of transmission, I also include the Arabic traditions that were picked up in Hebrew; in the next section, I ask whether these texts in their own turn constituted authentically Hebrew traditions.

Euclid and the Euclidean Tradition

We know of thirty-one manuscripts of versions (in the strict sense) of Euclid's text, *The Elements*.[45] Four translations based on Arabic sources (at least two manuscripts contain texts based on Latin sources) were executed in the thirteenth century, all in more or less the same geographical area. One of these versions is certainly related to the oldest Arabic versions, on which it casts new light.[46] Let me add that Euclid's work was not a tool for the scholar only; it was also one of the books sought out by the "cultivated man," as indicated by its inclusion in the catalogues of the libraries of several Jewish physicians.[47]

To these versions of the *Elements* we should add Hebrew translations of two Arabic adaptations of the Euclidean text. The first is an anonymous Hebrew version of Avicenna's adaptation or epitome of the *Elements*, namely, the section on geometry in his encyclopedic *al-Shifāʿ*, entitled *The Foundations of Geometry*.[48] The second is the section on geometry in *Midrash ha-Ḥokmah* (The Teaching of Wisdom [or Science]), an encyclopedia by Judah ben Solomon ha-Kohen of Toledo, which was originally written in Arabic but survives only in the Hebrew version produced by the author himself in 1244. The second part of this work incorporates an abridgement of the *Elements*, which undoubtedly draws on *al-Shifāʿ*;[49] it was designed as an introduction to the study of Ptolemy's *Almagest*.

Several Arabic commentaries on the *Elements* were translated into Hebrew during this same period: those by al-Fārābī,[50] Ibn al-Haytham, and Jābir Ibn Aflaḥ.[51] They triggered commentaries written directly in Hebrew, which testify to the exceptional importance accorded to the *Elements*. Some are mathematical, like those by Gersonides and several anonymous authors;[52] others, such as that by Abraham ben Solomon ha-Yarḥi of Lunel in the fourteenth century, have a philosophical character.[53] The *Data*, the *Optics*, and the Pseudo-Euclidean *Book of Mirrors* were also translated.

Theoretical Astronomy and Spherical Geometry

A significant number of the early translations fall into the domain of mathematical astronomy. In addition to the works of Ptolemy, there are Hebrew versions of Geminus,

[45] Lévy 1997a. By comparison, we currently know of around twenty manuscripts of the Arabic text; see Folkerts 1989, pp. 27–9.
[46] Lévy 1997b, 2005.
[47] Vajda 1958; Iancu-Agou 1975.
[48] Lévy 1997a, p. 80.
[49] Lévy 2000a.
[50] Freudenthal 1988a.
[51] The Arabic original is lost, and only a fragment of the Hebrew is extant; see Lévy 1997c, p. 434.
[52] Lévy 1992c. Among the important anonymous commentaries is a substantial "Book of Euclid," which is in fact an extensive mathematical encyclopedia in twelve parts, including, among other things, an exposition of the *Elements*; see Langermann 1984b.
[53] Freudenthal 1998.

al-Biṭrūjī,[54] Jābir Ibn Aflaḥ, al-Farghānī, Ibn al-Haytham,[55] Averroes,[56] and Jewish authors who wrote in Arabic, such as Joseph Ibn Naḥmias[57] and Joseph ben Israel Israeli.[58]

There were also translations of texts on spherics, part of the "small astronomy," or, as the Arabic tradition sometimes designates them, the "middle books"[59] – those by Autolycus, Theodosius, and Menelaus[60] – as well as of Arabic works that continue this tradition, such as those of Thābit Ibn Qurra or Jābir Ibn Aflaḥ on Menelaus's *Spherica.* This textual tradition was sufficiently alive to include, alongside translations of commentaries from Arabic (still not studied), works written directly in Hebrew, such as that by Gersonides on Menelaus (lost).[61]

Arithmetic and Number Theory

The Hebrew version of Nichomachus of Gerasa's *Introduction to Arithmetic* differs considerably from both the Greek text and the extant Arabic version by Thābit Ibn Qurra. It in fact derives from an (apparently lost) Arabic text that was itself a translation from a Syriac version (also lost) and includes important glosses ascribed to al-Kindī, who also paraphrased the text. The continuing study of the Hebrew text is manifested by the existence of commentaries as late as sixteenth-century Constantinople.[62]

The Andalusian scholar Abū al-Ṣalt (1068–1134) wrote an Arabic scientific encyclopedia whose original is lost; we know it only through two sections that survive in a Hebrew version, one of them on music[63] and the other on arithmetic (translated in Saragossa in 1395). The section on arithmetic consists mainly of a literal translation of the corresponding section of Avicenna's *al-Shifāʿ*. Yet Hebrew writings include several references to other parts of this encyclopedia (on optics, geometry, and astronomy), suggesting that those sections had been translated as well;[64] in the last case, the source quoting Abū al-Ṣalt may preserve a fragment of his own work.[65]

Thābit Ibn Qurra's *On Amicable Numbers* was translated, without mention of the author. All of the theorems in the Arabic text, but without the proofs, can be found in *The Book of Kings*, an original Hebrew arithmetic work that was probably written by Qalonymos ben Qalonymos, at the request of Robert of Anjou. This work made Thābit's theorems known to Jewish scholars of the fourteenth to sixteenth centuries in Spain, Provence, and Italy.[66]

Note the contact between different traditions evidenced by these translations and transmissions. Recent studies by historians of Arabic mathematics have established the existence of a continuous textual and theoretical tradition running from the ninth to the seventeenth century, including important developments in the thirteenth century. Thus the discoveries made by Fermat and Descartes between 1636 and 1638 had been known in the world of Arabic science long before then.[67] The Hebrew texts are a link in the chain of transmission of the Arabic tradition in medieval Europe; their diffusion makes it seem less likely that

54 Goldstein 1971.
55 Langermann 1990.
56 Lay 1996.
57 Freudenthal 1988–9; Morrison 2005.
58 Steinschneider 1893–1901, e39 [p. 115] and f6 [p. 140].
59 Steinschneider 1865.
60 Ginsburg 1943.
61 We know it only because Gersonides mentions it in the catalogue of his library; see Weil-Guény 1992, p. 361.
62 Langermann 2001; Freudenthal and Lévy 2004.
63 Avenary 1974.
64 Lévy 1996a, pp. 65 and 83.
65 Lévy 1997c, n. 11.
66 Lévy 1996a, pp. 76–82.
67 Rashed 1983; Hogendijk 1985.

tradition was unknown to European mathematicians. Still, it has not been established that Descartes and Fermat had any acquaintance with the Arabic tradition.

Algebra

Until recently we did not know of any Hebrew texts expounding the principles and techniques of Arabic algebra before the works of Simon Moṭot and Mordecai Finzi, in Italy in the second half of the fifteenth century. It was therefore generally believed that the Arabic algebraic tradition was unknown to Hebrew medieval scholars. Recent findings indicate that the picture is more nuanced. Although we cannot speak of a true Hebrew algebraic tradition – that is, of a continuous interest in the concepts, techniques, and problems of algebra – this discipline was not unknown to Hebrew-speaking scholars of the twelfth to fourteenth centuries.

In the twelfth century, we find recourse to algebraic techniques in the treatment of problems in practical geometry. This is true of Abraham bar Ḥiyya's book on geometry as well as of *Sefer ha-Middot*, attributed to Abraham Ibn Ezra. Although these two authors did not explicitly employ the technical terminology of algebra (*thing* or *root* for the unknown, *estate* or *square* for the square of the unknown), they applied the classical problem-solving procedures of Arabic algebra.

A Hebrew adaptation of the first part of al-Khwārizmī's classic work on algebra (ninth century) has recently been identified and studied. The source of this fragment is difficult to determine (whether from al-Khwārizmī's text itself or some other writing reproducing al-Khwārizmī's rules?); the date and place of the Hebrew text also remain unidentified.[68]

In 1271, Moses Ibn Tibbon translated al-Ḥaṣṣār's "short" treatise on arithmetic, undoubtedly written in the twelfth century in Andalusia or North Africa.[69] In the context of arithmetical problems ("practical" problems or those associated with certain series of integers), this work makes several references to "the algebraic method" (in Moses Ibn Tibbon's Hebrew, "the method of what is sealed [*ha-ḥittum*]") and employs its basic terminology ("thing" [Arab. *shayʾ*, Heb. *davar*] and "estate" [Arab. *māl,* Heb. *mamon*]). This aspect of the work, characteristic of an Arabic tradition of practical arithmetic, thus found a clear echo in Hebrew.[70]

Yet there is more, as evidenced by an unpublished treatise on arithmetic that contains important developments in algebra that cannot be reduced to elementary procedures. This work is the copiously annotated translation of *Talkhīs aʿmāl al-ḥisāb* (Concise Treatise on Calculation) by the well-known scholar Ibn al-Bannāʾ of Marrakech (1256–1321). The translator and commentator was a well-known Castilian-born astronomer, Isaac ben Solomon ben al-Aḥdab, who fled to Syracuse, in Sicily, in the late fourteenth century. There, according to his own account, he translated this "epistle on number," along with his annotations in which he drew on the "many" commentaries by Arabic scholars that he had collected in Islamic countries. In the section on algebra, Isaac ben Solomon demonstrates knowledge of the rich Arabic tradition that can be traced to the work of al-Karajī (tenth century).[71] We know nothing about the circulation of Isaac ben Solomon's work and in particular whether it was known to fifteenth-century Italian Jewish scholars who were interested in algebra.

68 Lévy 2002.

69 Aballagh and Djebbar 1987.

70 Lévy 2003, pp. 281–6.

71 Lévy 2003, pp. 286–301. Ilana Wartenberg, *The Epistle of the Number* (*Iggeret ha Mispar*) by Isaac ben Salomon ben al-Aḥdab (Sicily, 14th Century), Ph.D. dissertation, University Paris-7 and Tel Aviv University, 2007.

Archimedes and the Archimedean Tradition

To the anonymous Hebrew version of *Measurement of the Circle*, derived from an Arabic source and already noted by the bibliographers,[72] we should add a second version, identified in a collection of texts dealing with the isoperimetric problem. This second text, which derived from an Arabic source that is distinct from the first, bears the imprint – the style and terminology – of familiar translators of the thirteenth or fourteenth century, whereas the first text resembles older writings, such as Bar Ḥiyya's geometry.[73] *On the Sphere and the Cylinder,* with Eutocius's commentary, which generally accompanies it in Arabic sources, was translated into Hebrew.

A further indication of a Hebrew Archimedean textual tradition is the work by the fourteenth-century Spanish author Abner of Burgos, baptized as Alfonso of Valladolid: *Meyaššer ʿaqov* is a philosophical and mathematical work that contains many references (explicit and implicit) to "Archimedean" texts.[74]

Apollonius and the Apollonian Tradition

Apollonius's magnum opus, the *Conics*, was available in Arabic from the ninth century. There is no trace of a Hebrew version, even incomplete, of this treatise. However, several Hebrew "Apollonian" texts are associated with the *Conics* or with other works of Greek geometry or are derived from later discoveries in the geometry of curves and surfaces.

An anonymous monograph on the asymptotic property of the hyperbola (the subject of Proposition II 14 of the *Conics*), which was translated twice from Arabic into Hebrew, had a wide circulation, no doubt stimulated by Maimonides' philosophical interest in this property.[75] We also know of the following:

- an anonymous monograph, translated from Arabic, *The Resolution of Doubts*, concerning the last Premise of the Book of the Conics;
- a Hebrew translation of the *Monograph on the Triangle* by Abu Saʿdān, which draws on the parabola;
- a Hebrew translation of a collection of *Geometric Problems,* some of them derived from Apollonius' "lost" works; and
- a Hebrew translation of a text on the five platonic solids, enlarging Hypsicles' analyses in book XIV of Euclid's *Elements*; Apollonius's name is mentioned in relation to his (lost) treatise on the dodecahedron and icosahedron.[76]

Despite these translations, which evidently relay the Apollonian tradition in Arabic, it would overstate the case to speak of an Apollonian tradition in Hebrew. A comparison with the situation of the contemporary Latin writing on mathematics throws this into relief. Before the major Latin translations of the Renaissance, direct knowledge of the text of the *Conics* was on a level with what we have found in Hebrew: The first few definitions were translated from Arabic by Gerard of Cremona as an introduction to his Latin version of Ibn al Haytham's treatise on burning mirrors; in addition, John of Palermo translated the previously mentioned Arabic monograph on the asymptotic property of the hyperbola into Latin around 1230. Yet, the sustained interest in burning mirrors and more generally

72 Steinschneider 1893a, p. 502; Sarfatti 1968, §267.

73 Lévy 2011.

74 Gluskina 1983; Langermann 1988, pp. 38–9; Freudenthal 1990–1; Lévy 1992a, pp. 44–58; Langermann 1996, pp. 33–40.

75 Freudenthal 1988b; Lévy 1989a, 1989b.

76 Langermann and Hogendijk 1984.

in optics was reflected in the Latin version of the *Optics* of Ibn al Haytham (Alhazen), Witelo's *Perspectiva*, and several texts dealing with conic sections in the context of parabolic mirrors.[77] This interest in burning mirrors constitutes the main difference with Hebrew mathematics: Whereas, following Clagett, one can speak of a Latin tradition of conic sections, no comparable Hebrew tradition existed.

However, there is evidence of an Apollonian tradition of another type in Hebrew. I refer to an important text on the ellipse, translated from Arabic by Qalonymos ben Qalonymos in 1312 as the *Treatise on Cylinders and Cones*.[78] Its author, the Andalusian geometer Ibn al-Samḥ (d. 1035), a student of Maslama al-Majriṭī's, composed an ambitious treatise on the geometry of curves (no longer extant in Arabic), continuing the pioneering studies undertaken by the Banū Mūsā in the ninth century, especially with regard to conic sections. This work is significant evidence of advanced theoretical studies in eleventh-century Andalusia. After an introduction that promises to deal with cylinders, cones, and spheres, the Hebrew text deals chiefly with the ellipse, characterized by its property of having two foci and considered as a plane section of a cylinder. We do not know for whom and why Qalonymos translated this difficult and dense text. The copyist of the only known manuscript, working in Constantinople in 1506, emphasizes its difficulty and rarity.

TOWARD A DEFINITION OF HEBREW MATHEMATICS

How should we refer to the body of knowledge consisting of these texts – as "Hebrew mathematical literature," "mathematics in Hebrew," or "Hebrew mathematics"?

The term "Hebrew mathematics" offers a convenient parallel to "Arabic mathematics" or "Latin mathematics." However, it is problematic when it comes to conferring historical intelligibility on the genesis and development of the corpus of mathematical literature written in Hebrew, of which the first datable texts appear in the twelfth century. The difficulties are both historical and epistemological.

On the level of history, we know very little about the constitution of a Hebrew mathematical literature of which *Mišnat ha-Middot* may be an instance (i.e., the literature that may have been composed in the Arabic-speaking Jewish world around the time of the first great eruption of Arabic science in the Orient in the eighth to eleventh centuries). Even if one accepts Y. T. Langermann's hypothesis that *Mišnat ha-Middot* was written in the ninth century, concomitantly with similar works inspired by the burgeoning Arabic scientific culture,[79] this short treatise remains an exception. A similar problem is posed by the status of the rare and fragmentary mathematical texts scattered throughout biblical and postbiblical Hebrew literature.

On the epistemological level, it can be legitimately argued that the use of the phrase "Hebrew mathematics" automatically creates the perhaps unwarranted impression that all Hebrew mathematical works form a unity, with a coherence and logic of development of its own.

The discussion that follows does not pretend to resolve these questions. Its purpose is merely to characterize the emergence and growth of the rich and diversified corpus of Hebrew mathematical literature in the twelfth to fourteenth centuries and its repercussions in the fifteenth and the sixteenth centuries.

Three features characterize the texts making up the Hebrew mathematical literature: their common language; their sources, namely the Arabic mathematical traditions; and their links

77 Clagett 1980.
78 Lévy 1996b.
79 Langermann 2002, p. 173.

with traditional Jewish culture. The first two are analogous to characteristics defining "Latin mathematics." Consequently, pointing out the differences between these two traditions will allow us to characterize the Hebrew mathematical tradition more precisely.

The Hebrew technical language for mathematics developed along two lines: fidelity to the language of the traditional sources and a willingness to accept linguistic borrowings to express the new ideas propagated in Arabic. The translators were scholars with an intimate familiarity with Arabic language, belles lettres, and science. Indeed, in the countries of Islam, both East and West, Jews wrote not only philosophy and science but also grammar, ethics, and rabbinic jurisprudence in Arabic. Only liturgy and poetry (originally for the synagogue) remained, generally speaking, in Hebrew.[80] The first generation of translators had a pressing need to sustain and transmit this culture, as illustrated by the ethical will that Judah Ibn Tibbon, the "father of the translators," himself exiled from Granada to Provence in the mid-twelfth century, addressed to his son Samuel.[81] The latter's command of Arabic and Arabic culture won the praise of Maimonides, who was confident in his ability to translate the *Guide of the Perplexed*. Samuel's son-in-law, Jacob Anatoli, tells us that he studied mathematics with Samuel Ibn Tibbon (no doubt in Marseilles) from "Arabic books."[82] Jacob Anatoli himself translated the *Almagest* (1235). Samuel's son, Moses, was responsible for a version of Euclid's *Elements* (1270) and, more than a century after his grandfather's arrival in Provence, still proudly notes his Spanish ancestry in the colophons ("Moses, son of Samuel, son of Judah ben Tibbon, from Granada in Spain"), attesting to the lasting attachment to the Arabic Andalusian culture. Thus, although the great translation movement in Provence came in response to a "need" that was explicitly formulated by the leaders of the Jewish communities (Narbonne, Lunel, Marseilles, Béziers), its expansion would not have been possible had the translators and their descendants not been immersed in the world of Arabic culture and science. We know that Arabic language and culture survived in Christian Spain at least until the fifteenth century (in Toledo, Saragossa, Barcelona, and Granada), although it encompassed constantly shrinking circles.

One sees here what distinguishes the genesis of the Hebrew-Arabic scientific tradition in the thirteenth century from that of the Latin-Arabic scientific tradition in the twelfth century. The itineraries of great Latin translators such as Gerard of Cremona, Adelard of Bath, and Robert of Chester were the product of their own initiatives (even if they led to the formation of scholarly circles or scientific schools): These individuals left their native countries to pursue science where they had heard it was to be found, and to do so they had to learn Arabic. By contrast, Hebrew translators usually did not emigrate in order to acquire knowledge, and Arabic was a part of their original cultural ambiance. What is more, the work of Latin translators took place in a cultural context in which Greek science, in Latin garb, was not entirely unknown: There were the geometrical tradition of the *agrimensores*, the texts produced by or attributed to Boethius, and the Greco-Latin translations of Euclid and Ptolemy, which had no equivalent in the Hebrew-speaking culture. In addition, William of Moerbeke, in the thirteenth century, translated the entire Archimedean corpus from Greek sources – although little use seems to have been made of this prodigious labor.

Examining the development of Hebrew mathematics in its relationship with traditional Jewish culture is a complex task that involves various levels of analysis: the concept and practice of study in general (the dominant model remained that applied to the traditional biblical and rabbinic texts), the significance of a rigorously structured educational system from early childhood, the images of science provided by various cultural agents, the nature

[80] I should also underscore that medieval Hebrew poetry was profoundly marked by Arabic poetry.
[81] Abrahams 1926/76, pp. 51–93.
[82] Anatoli 1866/1968, pp. 11–12; Anatoli 2004, Vol. 1, p. 59.

of the mathematical enterprise, and the applications of mathematics that might stimulate its study. A study of the (widespread) discourse to legitimize mathematics, produced by scholars and scientists, would help us mark out the question better.[83]

In conclusion, Hebrew mathematics is first of all a corpus of texts that must be identified, edited, and analyzed historically. Yet even after scholars extract this textual object from the large body of medieval Hebrew literature, it will have no meaning (or interest) unless it is situated in the context of the textual and conceptual traditions of medieval science in Arabic, Latin, and the vernacular.

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9

Mathematical and Physical Optics in Medieval Jewish Scientific Thought

Eyal Meiron

Medieval Jewish scholars displayed relatively little interest in optical science, unlike their Muslim[1] and Western Latin[2] counterparts, and I am not aware of a single original treatise devoted primarily to optics by a medieval Jewish author.[3] Nonetheless, other texts do indicate some knowledge of and interest in optical matters. That knowledge is surveyed in this chapter, with a focus on physical and mathematical optics and omission of its anatomical and physiological aspects (the inner structure of the eye, the pathology of sight, etc.), which belong to the medical tradition.

The texts in which medieval Jewish authors refer to optical science can be divided into two main groups:

1. Scientifically oriented literature: general overviews, commentaries on optical treatises, and attempts to apply optics to the solution of non-optical scientific problems;
2. Occasional references to optical topics or notions in nonscientific literature (e.g., biblical exegesis, halakhic texts) that, though of less importance, provide evidence of the extent to which basic optical notions were assimilated into the general scholarly discourse.

This survey of the relevant Hebrew materials is prefaced by a brief examination of the optical treatises that were translated from Arabic into Hebrew. Of course, the short list that follows and the conclusions drawn from it are based on the surviving manuscripts. The assumption is that the extant manuscripts roughly reflect the variety of optical literature that was translated into Hebrew. Another tacit assumption is that the number of extant copies of a treatise is proportional to the number of copies of the treatise made over the centuries and thus indicative of the interest in the particular text.

[1] For an overview of the Islamic works on geometrical optics, see R. Rashed, “Geometrical Optics,” in R. Rashed, ed., *Encyclopedia of the History of Arabic Science* (London: Routledge, 1996), 2: 643–71.

[2] For an overview of the transmission of optics to the West, see D. C. Lindberg, “The Western Reception of Arabic Optics,” in Rashed, ed., *Encyclopedia of the History of Arabic Science,* 2: 717–29.

[3] This has been pointed out by G. Freudenthal, “Les sciences dans les communautés juives médiévales de Provence: Leur appropriation, leur rôle,” *Revue des études juives* 152 (1993): 29–136; idem, “Science in the Medieval Jewish Culture of Southern France,” *History of Science* 33 (1995): 23–58, on pp. 29–30.

Euclid's *Optics* was translated from Arabic into Hebrew, probably by Jacob ben Makhir Ibn Tibbon (1236–1305), as *Sefer Ḥilluf ha-mabbaṭim* (Book of the Diversity of Perspectives).[4] Six manuscripts are extant; some may have been produced in thirteenth- or fourteenth-century Spain, but the majority seem to have originated in fifteenth- or sixteenth-century Italy. The translator may have drawn on more than one Arabic manuscript.

The *Catoptrics*, attributed to Euclid in the Middle Ages, was known to the Latins as the *Liber de speculis* or the *Perspectiva*.[5] The Hebrew title is *Sefer ha-Marʾim* (Book of Mirrors).[6] It too was probably translated by Jacob ben Makhir, who may again have used more than one Arabic *Vorlage*. Seven copies of this translation are extant, six of them in the manuscripts that also contain the *Book of the Diversity of Perspectives*. The Hebrew translation contains many variants with respect to both the Greek *Catoptrics* and the Latin version.

Also translated into Hebrew was a short commentary on the *Book of the Diversity of Perspectives*, by the ninth-century Muslim scholar Thabit Ibn Qurra.[7]

Averroes' commentaries on Aristotle's *De sensu* (epitome), *De anima* (middle commentary), and *Meteorologica* (epitome),[8] which were translated by Moses Ibn Tibbon shortly after 1250, are not optical treatises. However, they contain discussions of topics such as the status of optical science, the nature of light and its speed, the mechanism that generates colors and atmospheric phenomena, and the propagation of vision. Hence they too should be mentioned here among the basic sources of optical knowledge available to Hebrew readers.

To these may be added a treatise written by the eleventh-century Spanish Muslim judge Ibn Muʿadh on the twilight and the height of the atmosphere. An English translation of the Hebrew version of this work, which until 1967 was incorrectly attributed to Ibn al-Haytham, has been published by Bernard R. Goldstein.[9] Again, the main interest of this work is not optics; however, Ibn Muʿadh uses a geometrical and optical analysis of the reflection of the sun's rays from the higher layers of the atmosphere to calculate the height of the atmosphere.

In addition to these translations into Hebrew, attention has recently been drawn to the existence of Arabic works on optics transcribed in Hebrew letters.[10] These works were intended for Jewish readers who knew Arabic but preferred to read it in Hebrew script. Three optical texts of this type have survived, of which two are only partially preserved: One is the first page of a treatise on twilight, which comes from Yemen,[11] and the second is a small and still unidentified fragment.[12] The third is a ninth-century work by Aḥmad Ibn ʿIsa on optics and burning mirrors, which also draws on optical and astronomical information to prove the sphericity of the heavens.[13]

4 M. Steinschneider, *Die hebräischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893), pp. 510–12.

5 Ibid., p. 512.

6 Ibid., pp. 512–13. *Marʾim* can also mean "images."

7 MS Mantua, Comunità Israelitica 3, 3.

8 For the present discussion, I have consulted microfilms of the following Hebrew manuscripts: Epitome of *De sensu* (MS Rome, Biblioteca Casanatense 3149 [148,5]); Middle Commentary on *De anima* (MS Cambridge, Trinity College F.12.35 [124,1]); Epitome of the *Meteorologica* (MS Munich, Bayerische Staatsbibliothek 208,3). All these works were translated by Moses Ibn Tibbon shortly after 1250.

9 Bernard R. Goldstein, ed. and trans., "Ibn Muʿadh's Treatise on Twilight and the Height of the Atmosphere," *Archive for History of Exact Sciences* 17 (1977): 97–118; idem and A. Mark Smith, "The Medieval Hebrew and Italian Versions of Ibn Muʿādh's 'On Twilight and the Rising of Clouds,'" *Nuncius* 8 (1993): 611–43.

10 Y. T. Langermann, "Transcriptions of Arabic Treatises into the Hebrew Alphabet: An Underappreciated Mode of Transmission," in F. J. Ragep and P. S. Ragep, eds., *Tradition, Transmission: Transformation* (Leiden: Brill, 1996), pp. 247–60.

11 Ibid., pp. 248–9.

12 Ibid., p. 248 and n. 6.

13 Ibid., pp. 248–53. For the Arab manuscripts of this treatise, see *The Optics of Ibn al-Haytham Books I–III: On Direct Vision*, ed. and trans. A. I. Sabra (London: Warburg Institute, 1989), p. xxxvii.

The paucity of Hebrew translations of optical texts, especially in comparison with the many translations into Arabic of classical works, not to mention original Arabic works, testifies to the relative lack of interest in optics among Jews. The entire list of translations and transcriptions presented here is shorter than the bibliography of optical treatises composed by a single Muslim scientist (albeit a most prolific one), namely, Ibn al-Haytham, who, according to A. I. Sabra, wrote sixteen treatises on optics.[14]

Still, the number of surviving copies of the Hebrew *Optics* and *Catoptrics* (seven manuscripts) is not insignificant. To put this in a broader context, consider that the Hebrew version of Averroes' epitome of the *Physics* survived in twenty manuscripts, his epitome of *De caelo* in eighteen manuscripts, his epitome of *De sensu* in twenty-five copies, and his middle commentary on *De caelo* in thirty-six manuscripts.[15] Thus at certain periods there was clearly some interest in optics, at least among Jewish scholars in Spain and Italy.

OPTICS IN SCIENTIFIC WORKS COMPOSED IN HEBREW

In addition to these translations from Arabic, readers of Hebrew could draw on a number of encyclopedic presentations of optical topics. Almost every medieval Hebrew encyclopedia deals with optics. The authors of all of them relied, directly or indirectly, on material in Arabic.

However, only two of the major encyclopedias of the Middle Ages include an independent section on optics – Abraham Bar Ḥiyya's *Yesodei ha-tevunah u-migdal ha-ʾemunah* (The Foundations of Understanding and the Tower of Faith) and Shem Ṭov ben Joseph Falaquera's *Rešit ḥokmah* (The Beginning of Knowledge).

The work by Abraham Bar Ḥiyya (Savasorda; d. ca. 1136) begins with a short discussion of the status of optics among the sciences.[16] Bar Ḥiyya distinguishes between what we may call "geometrical optics" and the physiology of sight. He maintains that the purpose of the science of optics is to correct optical illusions. Among the theoretical issues he discusses is the old controversy about the direction of the propagation of vision. He contrasts the extramission theory of sight to an intromission model, concluding with the traditional claim that the two models are equivalent as far as computational requirements are concerned. Bar Ḥiyya gives details of the Euclidean visual cone theory and presents the physical preconditions for sight (light, color, and opacity). He explains the distinction between self-luminous objects and objects seen because they reflect light, and he attempts to characterize different types of reflection according to the angle of reflection.

Shem Ṭov ben Joseph Falaquera's *Rešit ḥokmah* and *Sefer ha-Mevaqqeš* (Book of the Seeker), which contain only a rudimentary exposition of optics, were written in the second half of the thirteenth century.[17] The former offers definitions of the subject matter of optics (with a strong emphasis on catoptrics), along with an exposition of the different types of the propagation of vision (Falaquera himself is an extramissionist). Like Bar Ḥiyya, Falaquera contends that the role of optics is to recognize and then to explain optical illusions by studying the direct or reflected propagation of light. In the first book of *Rešit ḥokmah*

[14] Ibid., p. xxxvii.

[15] Freudenthal, "Science in Southern France," pp. 28–9.

[16] *La obra enciclopédica Yesodé ha-Tebuna u-Migdal ha-Emuna de R. Abraham bar Hiyya ha-Bargeloni*, ed. and trans. José M. Millas Vallicrosa (Madrid: Consejo Superior de Investigaciones Cientificas, Instituto Arias Montano, 1952).

[17] See Shem Ṭov ben Joseph Falaquera, *Rešit ḥokmah*, ed. M. David (Berlin, 1902). I also consulted MS Munich, Bayerische Staatsbibliothek 402; *The Book of the Seeker = Sefer ha-Mebaqqesh*, trans. and ed. M. Herschel Levine (New York: Yeshiva University Press, 1976).

(as throughout the second book), Falaquera's underlying text is a translation of the following passage in al-Farabi's *Iḥṣa al-ʿulūm*:[18]

By means of this science discrimination is made between what is seen as different from what is truly is and what is seen as it truly is; and the reasons why all this should be so are established by certain demonstrations.... This science explains the various devices for avoiding error and apprehending what the seen thing truly is.... By means of this art,... too, one can determine the size of distant and inaccessible bodies, the magnitudes of their distances from us and their distances from each other,... the heights of tall trees and walls and the width of valleys.[19]

These practical applications of optics, which are also mentioned by Falaquera, belong to the *missaḥa* tradition in Arabic optics, a tradition that, according to Elahe Kheirandish, is less emphasized in the Euclidean Arabic tradition.[20] Along with the manufacture of "burning mirrors" and other optical devices and the design of weapons and musical instruments, these practical applications belong more properly to what Falaquera calls the "Science of Devices" (*ḥok̲mat ha-taḥbulot*). This expression derives from Farabi in the work quoted earlier. In *Sefer ha-Mevaqqeš* Falaquera gives a brief presentation of the subject matter of optics in relation to that of the other sciences and of the intromission–extramission controversy.

Other encyclopedic works discuss optical notions, but only in non-optical contexts. For example, in his *Midrash ha-Ḥok̲mah* (The Exposition of Science), Judah ben Solomon ha-Kohen Ibn Matqah (first half of the thirteenth century) refers to optical matters in the course of his exposition of meteorological phenomena and alongside his discussions of physics, logic, and the theory of the soul.[21] His coverage of the intromission–extramission controversy implies that he himself was an intromissionist, though he notes that those who study optics often prepare their drawings as if the ray emerges from the observer's eye. Falaquera's *Deʿot ha-filosofim* (Opinions of the Philosophers) mentions the mechanism of the generation of colors and rainbows in the section on meteorological phenomena.[22] The same holds true for *Šaʿar ha-šamayim* (The Gate of Heaven) by Gershom ben Solomon of Arles, written during the last quarter of the thirteenth century.[23] As part of his description of the power of vision, Gershom also gives a lengthy review of the intromission–extramission debate, the mechanism of vision, and its physical aspects. In his *Liwyat ḥen* (Ornament of Grace), written at the end of the thirteenth century, Levi ben Abraham ben Ḥayyim briefly mentions burning mirrors and perhaps burning lenses in his discussion of physics.[24]

To sum up, the treatment of optics in the encyclopedic genre has the following general features:

- The discussions are relatively brief – no more than a few pages – and the treatment of most aspects is rudimentary and popular. The accounts are incomplete and cannot be considered to be a real overview of optical science. The absence of any treatment of dioptrics or recognition of its mechanism is a good example of this shortcoming.
- The accounts are preoccupied with the physical aspects of optics or with the status of optics among the sciences. For most topics there is no attempt at a mathematical treatment. Finally, these accounts occasionally combine different traditions.

[18] See I. Efros, "Palquera's *Reshit Hokmah* and Alfarabi's *Iḥṣā al-ʿUlūm*," *Jewish Quarterly Review* 25 (1935): 227–35.

[19] *The Optics of Ibn al-Haytham*, p. lvii.

[20] E. Kheirandish, *The Arabic Version of Euclid's Optics* (New York: Springer, 1999), pp. lvi–lvii.

[21] I consulted MS Oxford, Bodleian Library Mich. 551 [1321]), ff. 64–5, 88–90.

[22] MS Parma, Biblioteca Palatina 164 [3156], ff. 94–6.

[23] Gershom ben Solomon, *Sefer Šaʿar ha-šamayim* (Rödelheim, 1801), pp. 53–5. I also consulted MS. Vatican 388. For an English translation, see F. S. Bodenheimer, *The Gate of Heaven* (Jerusalem: *Qiryat Sefer*, 1953).

[24] MS New York, Jewish Theological Seminar 2559, fol. 13.

COMMENTARIES ON OPTICAL WORKS AND ORIGINAL HEBREW LITERATURE

Jewish scholars wrote commentaries on works dealing with optics or including some optical notions that had been translated from Arabic. Several examples of this genre have survived. The first is an anonymous Hebrew commentary, scarcely more than a page long, on the *Book of the Diversity of Perspectives.*[25] It is the last section of a commentary on three of Euclid's works, the others being the *Elements* and the *Data* (Hebrew: *Sefer ha-Mattanot*).

Two other examples are an anonymous commentary on Averroes' middle commentary on the *Meteorology*[26] and a commentary on his epitome of Aristotle's *Meteorology* by Solomon of Urgul, who was a student of Gersonides, as argued recently by Ruth Glasner.[27] In the course of his attempt to apply geometrical optics to meteorological phenomena, Solomon of Urgul admits his lack of mathematical skills.

Finally, a paragraph in Shabbetai Donnolo's tenth-century commentary on *Sefer Yeṣirah*, known under the title *Ḥak̲moni*, should be mentioned: Here Donnolo describes the spherical burning lens that uses water to ignite a fire as an example of God-bestowed human wisdom.[28] Donnolo included much scientific material in this commentary, despite the mystical nature of *Sefer Yeṣirah.*

OPTICS IN GERSONIDES

The most important scholarly supercommentary on Ibn Rushd's epitome of the *Meteorology*, at least from the optical point of view, is that by Levi ben Gershom (Gersonides; 1288–1344). Although Gersonides never wrote a systematic treatise on optics, the principles of his theoretical approach may be inferred from his discussion of two meteorological phenomena – the rainbow and the halo – which occupies the greater part of the third book of his supercommentary.[29] This is by far the most important text of its kind in Hebrew and the only one that offers a detailed mathematical account of the matters discussed.

According to Gersonides (who follows Averroes in this matter), there are two types of optical discussions: One derives from physics (Hebrew: *ha-ḥok̲mah ha-ṭivʿit*), the other from mathematics (Hebrew: *ha-limmudiyot*). Physical optics studies the physical principles of the formation of optical images and illusions (e.g., the assumption of the existence of light rays and of bodies capable of reflecting light). It also studies the physiological (and pathological) conditions of vision. In contrast, mathematical optics is concerned with the geometrical analysis of vision. Gersonides states that, because there are no Hebrew translations of the relevant works of Ibn al-Haytham (of whose existence he learned from Averroes), he will provide readers with a detailed account of some of the basic points of the geometrical analysis.

Gersonides' opinion on the classical problem of how visual information is transmitted to the observer may be presented on the basis of the previously mentioned distinction between

[25] MS Mantua, Comunità Israelitica 3, 4.

[26] MS Berkeley, University of California UCB 111, ff. 18–39.

[27] MS Paris, BNF héb. 964, 2. For the identification of this author, see Steinschneider, *Die hebräischen Übersetzungen*, p. 137; R. Glasner, "Levi ben Gershom and the Study of Ibn Rushd in the Fourteenth Century," *Jewish Quarterly Review* 86 (1995): 51–90, on pp. 61–5.

[28] *Sefer Ḥak̲moni le-rav Šabbetai Donolo*, ed. David Castelli (Florence, 1881).

[29] Ten manuscripts of Gersonides' supercommentary are extant. The discussion that follows is based on E. Meiron, "Gersonides' Supercommentary on Averroes' Epitome of 'Meteorology' 1–3: A Comparative Analysis of the Optical-Physical-Mathematical Aspects of the Theories of the Halo and the Rainbow with an Appendix Containing an Annotated Critical Edition," Ph.D. dissertation, Hebrew University of Jerusalem, 2003 (in Hebrew), which also contains a critical edition of the text.

the two models of vision.[30] From the standpoint of physical optics, Gersonides adopts a harmonizing approach: The intromission model applies to the perception of luminous objects, whereas the extramission model applies to the way in which the observer perceives nonluminous colored objects. This distinction, taken from Averroes, resembles a similar distinction made by Ibn Sina between *lumen* (the original Arabic term used by Ibn Sina is نور) and *lux* (ضوء).[31] From the standpoint of mathematical optics and its geometrical computations, the two models are practically equivalent.

According to Gersonides, three main mechanisms underlie optical explanations: the rectilinear transmission of light rays, reversion of light rays (Heb. *hithappek̲ut* or *ševirah*), and reflection of light rays (Heb. *nezorut*). *Nezorut* translates the Arabic انعطاف, which originally denoted refraction in Ibn al-Haytham's optical theory, on which Averroes drew.[32] The fact that Gersonides' definition of *nezorut* as a type of reflection is identical with the definition found in Abraham Bar Ḥiyya's *Yesodei ha-tevunah* indicates that Gersonides and Bar Ḥiyya depended on the same unknown source. The synonyms *hithappek̲ut* and *ševirah*, which translate the Arabic terms انعكاس and انكسار, respectively, signify reflection. These terms, too, derive ultimately from Ibn al-Haytham. A detailed analysis of Gersonides' definitions and use of the terms in the models of the rainbow and the halo indicates that reflection has a broader sense than the modern term does and also includes the change in the direction of a ray as it passes through another medium – what modern science calls "refraction." All of these mechanisms of "reflection" comply with the law of equal angles (i.e., the incident and reflected rays form equal angles with the reflecting surface).

Gersonides' explanation of the halo draws on the mechanism of *hithappek̲ut*. This explanation is not discussed here.

Gersonides' mathematical skills and theoretical ingenuity are in evidence when he studies the rainbow. His explanation expands on and criticizes the Aristotelian/Averroist explanation,[33] but relies exclusively on the mechanism of reflected light, thus lagging behind contemporaneous developments in the field in Christian and Muslim science (e.g., Robert Grosseteste, Theodoric of Freiberg, Kamal al-Din al-Farisi). In this context it should be noted that Gersonides does not cite any sources for his discussions of optics. However, his obvious lack of familiarity with these works in Arabic and Latin suggests that he had no extensive knowledge of treatises on optics (or other sciences) in these languages, although scholars still debate the possibility that he may have heard some oral information on various topics.

In Gersonides' model of the generation of the rainbow, the sun is placed at its astronomical distance from the observer.[34] This seemingly technical innovation has an important implicit result: It solves the apparent contradiction between Aristotelian astronomy, which locates the sun above the sphere of the moon, and the Aristotelian meteorological explanation of the rainbow, which locates it in the sublunar realm, together with the cloud that reflects its rays.[35] In this modified model, an optical-geometrical analysis of the reflection from a cloud

[30] For a survey of the intromission/extramission models in the history of optics, see D. C. Lindberg, "The Science of Optics," pp. 338–68 in idem, ed., *Science in the Middle Ages* (Chicago: University of Chicago Press, 1978).

[31] *Optics of Ibn al-Haytham*, 2: 22–3.

[32] For a detailed discussion of the Arabic traditions that are reflected in Gersonides' treatment of the optical mechanisms, see Meiron, "Gersonides' Supercommentary," pp. 120–6.

[33] For an account of Aristotle's theory of the rainbow, see C. B. Boyer, *The Rainbow: From Myth to Mathematics* (New York: Thomas Yoseloff, 1959), pp. 41–56; A. Sayili, "The Aristotelian Explanation of the Rainbow," *Isis* 30 (1939): 65–84.

[34] Interestingly enough, here Gersonides uses a value for the distance of the sun that is closer to Ptolemy's estimate than to his own. See R. Glasner, "The Early Stages in the Evolution of Gersonides' *The Wars of the Lord*," *Jewish Quarterly Review* 87 (1996): 1–46, on p. 39 n. 168.

[35] See Boyer, *The Rainbow*, p. 42.

reveals that Gersonides could have discarded Aristotle's assumption that a cloud consists of microscopic droplets that function like tiny mirrors. However, Gersonides adheres to this assumption, presumably because of his acquaintance with the rainbow produced when water is sprayed in the air. Indeed, his theory is of a macroscopic type, which treats the reflecting cloud as a coherent mirror, rather than studying the geometry of reflection inside the individual drops that compose the cloud.[36]

To account for the fact that only one optical-geometrical model of reflection (of the possible three) occurs in nature, Gersonides integrates a physical constraint into the optical account. This constraint posits a relationship between the distance from the sun to the center of the reflecting cloud and the distance from the observer to the same center. Only a model that complies with this constraint occurs in nature.

Gersonides' account of the colors of the rainbow and of the reversal of the order of the colors in the secondary rainbow depends on Aristotelian physical optics (i.e., the hypothesis that the colors of the spectrum are generated by the gradual weakening of light),[37] but his detailed geometrical analysis differs from Aristotle's.

Gersonides' main contribution to the science of optics lies in his brief discussion of the pinhole image, included in his *Astronomy* (i.e., Book V, Part 1 of *Wars of the Lord*). Here, again, his aim is not to formulate a theory of this classical problem in optics. Rather, he is interested in the usefulness of the camera obscura for astronomical observations,[38] including measuring the sun's diameter in relation to its distance from the earth,[39] determining the magnitude of a solar or lunar eclipse, and even attempting to measure the size of Venus and Jupiter.

Gersonides correctly describes the basic phenomenon of pinhole images[40] and analyzes the path of light rays through the aperture and the subsequent generation of the partially rounded image on the screen. He seems to have been the first astronomer in the West to realize that, for quantitative measurements, the size of the aperture must be taken into account.[41] Historians of science differ in their evaluations of his solution to the pinhole-image problem.[42] However, it is widely agreed that Gersonides discovered the theoretical principles of the phenomenon without, however, stating the full explanation. Egidius of Baisiu (early fourteenth century) offered a theory of pinhole images that seems to be an explicit formulation of Gersonides' implicit explanation; the possibility that he was acquainted with Gersonides' work cannot be ruled out. However, chronological considerations militate in favor of the assumption that his work was independent of that of Gersonides.[43]

The links between optics and astronomy in Gersonides' work come to the fore when he describes an experiment he conducted to determine the eccentricity of the eye. Practical

36 This may be compared with the microlevel analysis of the path of light rays in water droplets as championed by Theodoric of Freiberg and Kamal al-Din al-Farisi.

37 Aristotle, *Meteorology* III.4 ($374^{b}9$–17).

38 For the context of the treatment of pinhole images in Gersonides' thought, see Bernard R. Goldstein, "Levi ben Gerson: On Astronomy and Physical Experiments," in S. Ungaru, ed., *Physics, Cosmology and Astronomy, 1300–1700: Tension and Accommodation* (Dordrecht: Kluwer Academic Publishers, 1991), pp. 75–82.

39 Gersonides used his solar measurements as a basis for preferring the eccentric hypothesis to the epicyclic hypothesis. See Glasner, "Early Stages," p. 13.

40 This achievement should not be underestimated. For examples of flawed descriptions of the basic phenomena of pinhole images by Western scholars, even in the Late Middle Ages, see D. C. Lindberg, "The Theory of Pinhole Images in the Fourteenth Century," *Archive of History of Exact Science* 6 (1969/70): 299–325.

41 Goldstein, "Levi ben Gerson," p. 78.

42 See J. L. Mancha, "Egidius of Baisiu's Theory of Pinhole Images," *Archive of History of Exact Science* 40 (1989): 1–36, on pp. 29–30; Goldstein, "Levi ben Gerson," pp. 75, 80; Lindberg, "Theory of Pinhole Images," pp. 303–8.

43 Mancha, "Egidius of Baisiu's Theory," pp. 30–1.

astronomical requirements motivated him to conduct this experiment: It enabled him to obtain accurate results from his astronomical measurement device, the Jacob staff. His quantitative result was not obtained again until 250 years later, by the English astronomer Thomas Harriot.[44]

A more significant link between optics and astronomy in *Wars* V.1 can be found in Gersonides' new models of lunar motion, which seem to be based on an optical analogy involving reflection.[45]

OPTICS IN NONSCIENTIFIC LITERATURE

Here and there Jewish scholars drew on optical theories or ideas to make a philosophical or exegetical point, demonstrating that knowledge of the basic principles of optics was more widespread than the absence of specialized treatises on the subject would lead one to think. Several examples, from various fields, are cited in this section.

In his philosophical work *Fons vitae*, the Neoplatonist and poet Solomon Ibn Gabirol (Avicebron; ca. 1020–57) uses the common analogy between the powers emanating from all simple substances and the light radiating from the sun.[46]

In biblical exegesis, the most explicit references to optics occur in relation to the rainbow in Genesis 9. Abraham Ibn Ezra (1089–1164) mentions the "opinion of the Greek sages" concerning the generation of the rainbow.[47] Naḥmanides (1194–1270) refers to the "Greeks" and the appearance of a rainbow in "a vessel of water held against the sun."[48] Baḥya ben Asher (late thirteenth century) bases his commentary on the same verses on "scholars of science" as well as on Ibn Rushd (Averroes). He then offers a relatively detailed description of the rainbow and its colors.[49]

I am aware of one optical reference in the medieval halakhic literature. In his commentary on M *Kelim* 30:2, Maimonides (1135–1204) mentions a transparent screen and the distorted images of objects observed through it and notes that the "science of vision" studies these distortions.[50]

With regard to Jewish knowledge of optics, there is a vast nonscientific field that calls for further study: kabbalistic and mystical literature from the twelfth century onward. That at least some optical notions found their way into various kabbalistic treatises is to be expected, given the deep significance of light and color symbolism in mystical thought; by the same token, medical traditions could be expected to have shaped other kabbalistic notions because of the prominence of anthropomorphic symbolism in the same domain. Gershom Scholem drew scholarly attention to the prominent role of optics in mysticism; although his main interest was its symbolic dimension, he nevertheless noted the similarity between the concept of emanation of the divine powers from the "One" and the extramissionist model in optics.[51] The topic of colors in mystical thought has recently been treated by Moshe Idel, but in relation to the subject of prayer and the specific intentions (*kawwanot*) that should accompany

44 Goldstein, "Levi ben Gerson," p. 77.
45 Ibid.
46 Avencebrolis (Ibn Gabirol) *Fons vitae*, ed. C. Baeumker (Münster, 1895), p. 196.
47 *Miqra'ot Gedolot 'Haketer'*, ed. by M. Cohen (Ramat-Gan: Bar Ilan University, 1997), "Bereshit" (Hebrew), p. 102.
48 Ibid., p. 103.
49 *Peruš Rav Baḥya ʿal ha-Torah* (Jerusalem: Michlala Yerushalayim, 1994).
50 Langermann, "Transcriptions of Arabic Treatises into the Hebrew Alphabet," p. 249 n. 6.
51 G. Scholem, "Colors and Their Symbolism in Jewish Tradition and Mysticism," *Diogenes* 108 (1979): 84–112; 109 (1980): 64–77.

it, and not from a scientific point of view.[52] To the best of my knowledge, a comprehensive study to identify, characterize, and evaluate the importance of these notions in the earlier stages of kabbalistic literature has yet to be undertaken.

A few words of methodological caution are in order. It is well known that medieval Jews did not invent kabbalistic light symbolism; rather, it originated in traditions that go back to the Hellenistic and Roman periods, traditions that may reflect the optical science of that earlier age. Hence the incorporation of optical notions in kabbalistic works does not necessarily indicate that Jewish mystics were acquainted with the contemporary optical literature. The leap between the identification of certain optical notions on a phenomenological level and the formulation of conclusions on the historical level must be taken cautiously.

CONCLUSION

Jews showed relatively little interest in optics during the Middle Ages. Only a few works were translated from Arabic into Hebrew or transcribed in Hebrew letters. The highly mathematical character of these works suggests that they were translated for their mathematical value rather than because of an interest in optics per se.

So far as we know, no original Hebrew treatise on optics was ever written. Most of the optical materials in Hebrew are popular overviews or incidental references. This indicates that optics was regarded as a subject about which educated persons need have only a basic acquaintance.

Gersonides is the only Jewish figure who did serious work in optics. However, even this work was not systematic, but rather an offshoot of his scientific interests in other fields, notably astronomy. It combines traditional optical theory with innovations based on rigorous mathematics. Gersonides' work on optical topics reflects his general harmonizing approach to the different branches of science.[53]

The unimportance of optics in Jewish thought stands in contrast to the interest Jewish thinkers evinced in the sciences in general. Its unimportance cannot be explained by the mathematical skills required to master the subject. Astronomy, which demands no lesser a command of mathematics, flourished among medieval Jews just as it did among their neighbors in the East and West.

In the absence – in most cases – of information about why translators or their patrons were interested in translating specific works, Gad Freudenthal suggested that we analyze the motives that spurred Jewish thinkers to undertake scientific investigation in general.[54] He proposed a religious motivation (e.g., Maimonides' view of the study of the sciences as a religious obligation) and a practical motivation (e.g., the application of astronomy to astrology or, to a limited degree, to calendric computations). Some have argued that the relative lack of interest in certain branches of science, such as optics or music, occurred because they have no application to these matters.

[52] See, for instance, M. Idel, "Kabbalistic Prayers and Colors," 3: 17–27 in D. Blumenthal, ed., *Approaches to Judaism in Medieval Times* (Atlanta: Scholars Press, 1988).

[53] For the philosophical and realistic (i.e., noninstrumental) background of this approach and its implications, see Gad Freudenthal, "Sauver son âme ou sauver les phénomènes: Sotériologie, épistémologie et astronomie chez Gersonide," pp. 317–52 in idem, ed., *Studies on Gersonides: A Fourteenth-Century Jewish Philosopher-Scientist* (Leiden: Brill, 1992); idem, "Gersonides: Levi ben Gershom," pp. 739–54 in S. H. Nasr and O. Leaman, eds., *History of Islamic Philosophy* (London: Routledge, 1996), esp. pp. 741–3 and 746–8.

[54] Freudenthal, "Science in Southern France," pp. 31–9.

Considering the interest in optics in the Islamic world, R. Rashed noted,

> This massive movement of translation of optical texts was not provoked, as one would be tempted to think, by only scientific and philosophical interests, but also by anticipated applications. Caliphs and princes encouraged research into what scientists presented to them as a formidable weapon, and had allowed Archimedes to defeat the fleet of Marcellus: burning mirrors. It is for these princes that research into catoptrics was taken up to fill them with wonder and to entertain them.[55]

Rashed's argument, which refers to the social context of the practice of science, identifies courtly patronage as a factor in the initial development of optics. The absence of similar courtly patronage in Jewish communities of the time, for obvious reasons, may also help explain the minor status of optics in medieval Jewish science.

55 Rashed, "Geometrical Optics," pp. 644–5.

10

The Evolution of the Genre of the Philosophical-Scientific Commentary

Hebrew Supercommentaries on Aristotle's Physics

Ruth Glasner

INTRODUCTION

The philosophical or scientific commentary was a prevalent genre in Late Antiquity and throughout the Middle Ages. It served to present and examine canonical texts or textbooks and in some cases to revise them. Writing a commentary was an active dynamic process and by medieval standards was a common way of "doing" science. In the introduction to his classical book on Greek mathematics, Heath writes that "the Greeks with their unclouded clearness of mind and their freedom of thought, untrammeled by any 'Bible' or its equivalent, were capable of creating the sciences as they did create them."[1] Does the existence of canonical writings indeed hinder the development of science and discourage creativity? Heath's opposition between freethinking Greeks and those whose thought was trammeled by canonical texts is somewhat romantic. Within a few centuries, Plato and Aristotle became *ho theios* and *ho daimonios,* respectively. Their writings acquired a canonical status, and the genre of commentaries on their books flourished. Commentaries were also written on Euclid's *Elements,* Ptolemy's *Almagest,* Hippocrates' medical writings, and other scientific treatises. The Stoics, who avoided canonical texts,[2] were no more creative than the Platonists or Aristotelians.

"Jewish religion and culture," writes Funkenstein, "more than any other culture known to me, are saturated with texts and commentaries on texts. Underlying any corner in Jewish culture and religion is a text, a commentary on a text or a commentary on a commentary."[3] This is true not only of religious studies but also of the study of the foreign wisdom. Furthermore, we can sometimes detect structural and stylistic similarities between biblical commentaries and philosophical commentaries.[4]

The Corpus

From the mid-twelfth through roughly the mid-fourteenth century, philosophical and scientific texts were translated from Arabic into Hebrew, and Jews began to study philosophy and

[1] Thomas L. Heath, *A History of Greek Mathematics* (Oxford: Oxford University Press, 1921 [New York: Dover, 1981]), 1: 9.

[2] H. Gregory Snyder, *Teachers and Texts in the Ancient World* (London: Routledge, 2000), ch. 1.

[3] Amos Funkenstein, *Styles in Biblical Exegesis in the Middle Ages* (Tel Aviv: Ha-universitah ha-meshuderet, 1990), p. 9 (in Hebrew).

[4] See the concluding section of the chapter, p. 206.

I would like to thank Mauro Zonta, who sent me a prepublication copy of his *Hebrew Scholasticism in the Fifteenth Century.* I am grateful to Gad Freudenthal and Sara Klein-Braslavy, who read this chapter and made helpful remarks.

the sciences in Hebrew.[5] Aristotle's logic, natural philosophy, and metaphysics were a major part of the medieval curriculum. Jews, however, studied them indirectly. It was mainly Ibn Rushd's commentaries on the works of Aristotle that were translated into Hebrew, where they became the standard textbooks studied by Jews. The tradition of studying through commenting was carried on in various circles. In this way, a body of supercommentaries – commentaries on Ibn Rushd's commentaries on Aristotle – emerged in the fourteenth and fifteenth centuries. In this chapter, I focus on the Hebrew supercommentaries on the *Physics*, which is the first,[6] longest, and most influential of Aristotle's treatises on natural science.[7]

Aristotle's *Physics* was translated into Arabic by Isḥaq Ibn Ḥunayn; several expositions in Arabic followed, notably in encyclopedias and commentaries. The genre of the philosophical-scientific commentary culminated with Ibn Rushd (Averroes, 1128–98), who became known among the Christians as "the Commentator." Ibn Rushd wrote three types of commentaries on the works of Aristotle: short, middle, and long.[8] There is an obvious trend of profession-alization from the short commentaries to the middle ones and from the middle to the long. It is not always easy to characterize the short and middle commentaries, because there are significant variations in their style and structure.[9] On the whole, however, the short commentaries (or "epitomes") are summaries that do not follow Aristotle's text and sometimes do not even cover all the subjects addressed by Aristotle. The middle commentaries cover Aristotle's text more systematically. In them Ibn Rushd usually conveys Aristotle's idea in paraphrase; sometimes he adds his own original exposition. The long commentaries include extensive verbatim quotations from Aristotle's text, followed by detailed comments. The translations of these commentaries provided Hebrew scholars with their first direct access to Aristotle's text and allowed them to distinguish the views of "the Philosopher" from those of "the Commentator." They are more difficult and are apparently addressed specifically to scholars. Ibn Rushd wrote short and middle commentaries on almost all of Aristotle's works and long commentaries on five major texts, including the *Physics*.[10]

Although Aristotle's *Physics* was never translated into Hebrew, Ibn Rushd's three commentaries were translated and studied.[11] The Short Commentary (or epitome) was translated in 1250 or somewhat later by Moses Ibn Tibbon in Provence; it soon became the first Hebrew "textbook" in physics. Commentaries on this translation were written in Provence in the first half of the fourteenth century.[12] Ibn Tibbon's translation was widely accessible; there are

5 Much has been written on this subject. The following are of particular note: Moritz Steinschneider, *Die hebräischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893); Gad Freudenthal, "Les sciences dans les communautés juives médiévales de Provence: leur appropriation, leur rôle," *Revue des études juives* 152 (1993): 29–136; idem, Chapter 3 in this volume; Mauro Zonta, *La filosofia antica nel medioevo ebraico* (Brescia: Paideia, 1996).

6 First in the standard arrangement of Aristotle's corpus.

7 The Hebrew supercommentaries on logic have been studied by Rosenberg and Manekin. See Shalom Rosenberg, "Logic and Ontology in Jewish Philosophy in the 14th Century," Ph.D. dissertation, Hebrew University of Jerusalem, 1973 (in Hebrew); Charles H. Manekin, "Gersonides' Logical Writings: Preliminary Observations," *Proceedings of the American Academy of Jewish Research* 52 (1986): 85–113; idem, "Scholastic Logic and the Jews," *Bulletin de philosophie médiévale* 41 (1999): 123–47.

8 On the three genres, with particular emphasis on the three commentaries on the *Physics*, see Steven Harvey, "Similarities and Differences among Averroes' Three Commentaries on Aristotle's *Physics*" (forthcoming); idem, "Averroes on the Principles of Nature: The Middle Commentary on Aristotle's *Physics I–II*, critical edition and English translation," Ph.D. dissertation, Harvard University, 1977, pp. 114–20.

9 In some cases (e.g. *De animalium*), the identification of the commentary as short or middle is debated.

10 The others are the *Posterior Analytics, De caelo, De anima*, and the *Metaphysics*.

11 Steinschneider, *Die hebräischen Übersetzungen*, pp. 108–25.

12 See infra, pp. 188–90.

still twenty-nine extant manuscripts today. From remarks by later commentators, we learn that they compared several copies of it when writing their supercommentaries.[13]

The Middle Commentary was translated by Zeraḥyah ben Yiṣḥaq ben She'altiel in 1284 in Italy, and a second time, in 1316, by Qalonymos ben Qalonymos in Provence. Zeraḥyah's translation did not circulate widely,[14] and no supercommentaries on it are known. In contrast, Qalonymos's translation became popular right away and replaced the Short Commentary as the leading Hebrew textbook in physics. All later writers on the Middle Commentary used this translation, which survives in more than forty manuscripts.

The Long Commentary was translated in the first half of the fourteenth century in Provence. The exact date and the identity of the translator are not certain.[15]

Jewish scholars wrote commentaries on these three commentaries by Ibn Rushd. Some of the commentaries are by known authors; others carry no identification. I refer to those in the latter category by the first letter(s) of the library or libraries of the extant manuscript(s).

The "Upgrading" of the Texts

In the wake of each of the translations of Ibn Rushd's three commentaries, the norms for supercommentaries were upgraded. At the beginning of the fourteenth century, the textbook was the Short Commentary. Levi ben Gershom wrote on the Short Commentary on the *Physics* and subsequently on the Middle Commentary. Both commentaries bear the date 1321, only five years after Qalonymos translated the Middle Commentary. Gersonides also began a supercommentary on the Long Commentary on the *Metaphysics* shortly after its translation by Moses of Salon.[16] Ṭodros Ṭodrosi turned to the Long Commentary on the *Physics* a few years after its translation. At this stage it became the norm among Jewish scholars to comment on the easily accessible Middle Commentary and to consult the Long Commentary.[17] Several commentaries are based on Aristotle's texts, quoted from the Long Commentary.[18]

At this stage, access to the text became a factor. The Long Commentary on the *Physics* is the longest of Ibn Rushd's long commentaries. It was not copied frequently; only one complete copy is extant today.[19] Altogether we have in extant manuscripts four copies of books I–IV[20] and only two of books V–VIII.[21] There is no evidence that many more copies of books V–VIII circulated in the fourteenth and fifteenth centuries. In the fourteenth century, we find traces of these books in Provence. Levi ben Gershom lists the Long Commentary

[13] For instance, ha-Penini writes, "I have also found in some of the books a version, which is not found in most of the books" (MS Parma De Rossi 1399, f. 156a11). Ha-Levi writes, "After I wrote this I found in some of the books" (MS Oxford Mich. 538, f. 62b).

[14] Today there are two extant manuscripts. A third was destroyed in the fire in Turin in the twentieth century. There are no commentaries on this translation.

[15] On this subject see Steven Harvey, "A Hebrew Translation of Averroes' Prooemium to his Long Commentary on Aristotle's *Physics*," *Proceedings of the American Academy for Jewish Research* 52 (1983): 55–84.

[16] The translation was probably done between 1320 and 1325. See Zonta, *La filosofia antica nel medioevo ebraico*, p. 243. Gersonides' commentary is incomplete and undated. I tend to think that he started to work on it about 1325, after finishing the philosophical commentaries and before beginning the biblical commentaries.

[17] Yiṣḥaq Ibn Shem Ṭov mentions the short commentary as well: MS Cambridge 8.19, f. 31b17.

[18] See, e.g., infra pp. 193, 195.

[19] Paris BNF 883, Spanish script, 15th cent.

[20] Books I–IV: Paris BNF 884, Byzantine script, 15th cent.; Oxford 1388, Spanish script, 15th cent. Books I–II: Munich 91/4, Spanish cursive script; Cincinnati 723 (beginning missing, only to the middle of book II). Books III–IV: Cambridge Add. 632 (beginning and end missing), Oriental script, 15th–16th cents.; Vienna 155.

[21] Books V–VIII: Cambridge, Harvard Heb. 40, Spanish script, 14th cent. There is another partial copy of book VIII from text 45 to the end (MS Milan J 7 inf).

in the catalogue of his personal library,[22] but does not quote from it in his writings. The author of the anonymous commentary L/O, probably a student of Levi ben Gershom, and Ṭodros Ṭodrosi (in 1334) had complete copies of the Long Commentary.[23] Moses ben Judah, author of the Hebrew encyclopedia *ʾAhavah ba-taʿanugim* (1354, Spain or Provence), quotes it once.[24]

It seems that in the fifteenth century, only scholars in Spain had access to the complete Long Commentary.[25] Byzantine and Italian commentators wrote only on the first half of the *Physics* (books I–IV) or on parts of it.[26] In the fifteenth century, commentaries on the *Physics* were written by several circles of scholars who probably gathered around a copy of the Long Commentary.

The Circles of Commentators

The extant Hebrew supercommentaries on the *Physics* can be divided into four groups: those from the first half of fourteenth-century Provence and those from the second half of fifteenth-century Italy, Byzantium, and Spain. Because, however, not all the commentaries survived and because some fragments are difficult to identify, we cannot rule out the interesting possibility that some commentaries were written outside these circles.

The rather clear "map" of the supercommentaries and, most notably, their division into early and late have been blurred by several errors of identification. First, Steinschneider dated several commentaries on Moses Ibn Tibbon's translations of short commentaries by Ibn Rushd on natural science to the thirteenth century. These include Jedaiah ha-Penini's commentary on the *Physics* and four commentaries by Urgul, Porfash, and Vital on other short commentaries. These early datings are mistaken.[27] Second, Steinschneider ascribed two typically late commentaries (see infra C/M and P1) to Isaac Albalag and Moses Narboni, respectively. These misidentifications obscured the fairly clear distinction between early and late commentaries, which is evident in their style and structure. In this chapter, I present the stylistic criteria and show that there was a process of "upgrading" the style from the early to the late commentaries.

STYLISTIC PATTERNS

The commentary was always a relatively structured literary genre. From its Greek beginnings to the late Latin phase, the structure of the philosophical commentary tended to become more elaborate. Perhaps the most notable manifestation of this trend was the development of the question commentary.[28] Commentators have always raised questions and doubts; doing

[22] Gerard E. Weil, *La Bibliothèque de Gersonide d'après son catalogue autographe* (Louvain: Peeters, 1991), p. 47, no. 33. The reference (פרוש אבן רשד ארוך לספר השמע) seems to be to the Long Commentary, but it could also be to the Middle Commentary. There are no references to the Long Commentary in Gersonides' writings. The most likely explanation is that he did not acquire the manuscript until after completing his philosophical commentaries in 1325 and perhaps also the *Wars of the Lord* in 1329. The catalogue was compiled later (ibid., pp. 137–8).

[23] See infra, p. 191.

[24] I am grateful to Esther Eisenmann for this information.

[25] Of the two copies of books V–VIII extant today, MS Paris BNF héb. 883 is in a fifteenth-century Spanish script. The other manuscript of books V–VIII (Harvard 40) is from the fourteenth century.

[26] One of the copies of books I–IV extant today, MS Paris BNF héb. 884, is in a fifteenth-century Byzantine script.

[27] See Ruth Glasner, "Levi ben Gershom and the Study of Ibn Rushd in the 14th Century," *Jewish Quarterly Review* 86 (1995): 51–90.

[28] Another interesting manifestation was the formal eight-point introduction. This pattern was developed by late Greek commentators of the school of Alexandria and was adopted, to various degrees, by the Arabs. See Steven

so increasingly dominated the structure of the commentary in the Latin West. The scholastic method, writes Grant, "is more intimately associated with the *quaestio* form of literature and analysis than with anything else."[29] We can distinguish two major types of Latin commentaries on Aristotle, corresponding to the two main methods of teaching in the universities: the *lectio* and the *disputatio*.[30] The first is the literal or textual commentary, the second, the book of *quaestiones*. For instance, Ockham wrote both a textual commentary and a book of questions on Aristotle's *Physics*. In his *Expositio in libros physicorum aristotelis*, he quotes Aristotle's text and adds his own explanations and remarks. In some cases he incorporates a disputation within the exposition.[31] In his *Quaestiones in libros physicorum aristotelis*, he discusses 151 questions, following the formal structure of the disputation.[32] Among the leading commentators on the *Physics*, Thomas Aquinas follows the *lectio* form, but Aegidius Romanus, Jean Buridan, John of Janduno, Duns Scotus, Marsilius of Inghen, Johannes Canonicus, Albert of Saxony, and others all use the *quaestiones* format.[33] It is more or less agreed that the latter genre developed from the former.[34] The questions, originally added after the lectures, gradually became independent. Thus there were lecture-dependent disputations and independent disputations;[35] both reflected the interactive argumentative character of the disputation in the universities.

Here I examine the evolution of the scientific-philosophical commentary as a literary genre in the Jewish cultural microcosm. The Jews, following al-Fārābī and Ibn Rushd, used the genre of the textual commentary. Although the question commentary never flourished in Hebrew as it did in Latin, we nevertheless witness a similar trend from the pattern of quoting and explaining to that of asking and answering questions and from the less structured to the more formally structured commentary. These trends culminated in the colossal scholastic commentary by Judah Messer Leon in Italy and those by Isaac ben Shem Ṭov and Shem Ṭov ben Joseph Ibn Shem Ṭov in Spain.

To trace the changes in the Hebrew philosophical commentary from the fourteenth century to the fifteenth, I begin with a list of the patterns found in the commentaries on the *Physics*.[36] I refer to Patterns 1–4 as the "simple patterns" and to Patterns 5–6 as the "scholastic

Harvey, "The Author's Introduction as a Key to Understanding Trends in Islamic Philosophy," pp. 15–32 in Rüdiger Arnzen, Gerhard Endress, and Jörn Thielmann, eds. *Words, Texts and Concepts* (Leuven: Peeters, 2004); Sara Klein-Braslavy, "The Alexandrian Prologue-Paradigm in Gersonides' Writings," *Jewish Quarterly Review* 95 (2005): 257–89.

29 Edward Grant, *Planets, Stars and Orb: The Medieval Cosmos 1200–1687* (Cambridge: Cambridge University Press, 1994), p. 23.

30 See Anthony Kenney and Jan Pinborg, "Medieval Philosophical Literature," in Norman Kretzman, Anthony Kenney, and Jan Pinborg, eds., *The Cambridge History of Later Medieval Philosophy* (Cambridge: Cambridge University Press, 1982), pp. 11–42, on pp. 20, 29. For a finer classification, see Olga Weijers, "Les genres littéraires des textes hébreux ou traduis de l'arabe et ceux des textes latines," in C. Sirat, S. Klein-Braslavy, and O. Weijers, eds., *Les méthodes de travail de Gersonide et le maniement du savoir chez les scolastiques* (Paris: Vrin, 2003), pp. 32–39, on p. 32.

31 E.g., in book IV, chapter 6, §1, he introduces the definition of place. In §2 he presents the *Opinio propria*, in §3 the *Contra opinionem*, and in §4 the *Solutio obiectionum*. In §5 he resumes the exposition of Aristotle's text. Another example: Chapter 22, §§1–3 follows Aristotle's text; §4 is a discussion.

32 Most questions start with *utrum*. The discussion starts with the *quod sic* and *contra* brief presentation. A typical structure is the presentation of the author's opinion, objections to it, and a rebuttal of the objections. There are several variants of this pattern.

33 Most, but not all, *Quaestiones* commentaries follow the order of the eight books of Aristotle's *Physics*. Ockham's *Quaestiones*, for instance, does not.

34 Kenney and Pinborg, "Medieval Philosophical Literature," pp. 20, 25, 30; Edward Grant, *The Foundations of Modern Science in the Middle Ages* (Cambridge: Cambridge University Press, 1996), p. 40; Olga Weijers, *La "disputatio" dans les facultés des arts au Moyen Âge* (Turnhout: Brepols, 2002), pp. 25, 87–9.

35 Kenney and Pinborg, "Medieval Philosophical Literature," p. 23.

36 The introduction patterns require a separate study and are not addressed here.

patterns." The former were patterns that Jewish commentators found in Ibn Rushd and other Arabic commentaries; the latter were new patterns that they adopted in the course of the fourteenth and fifteenth centuries. I use the adjective "scholastic" to describe the intricate, perhaps excessively systematic style of these patterns. In the concluding section, I briefly address the question whether the use of these patterns indicates a Christian scholastic origin.

1. **Abridged quotation pattern**. The beginning of the commented passage from Ibn Rushd is quoted, followed by "etc." (כו' or וכו'), or the beginning and end of the commented passage are quoted. The explanation usually starts with "that is" (כ"ל, ר"ל, כלומר). Ṭodrosi introduces quotations with the phrase, "thus says" (כה דבר).[37]
2. **Full quotation pattern**. Long quotations of Ibn Rushd's text (sometimes tending to paraphrase) are sometimes interrupted by clarifications. At first sight it seems that Pattern 1 commentaries were written for readers who had Ibn Rushd's text to hand, whereas Pattern 2 commentaries could be read by those who did not have access to the text. However, Klein-Braslavy and Manekin have shown that this was not the only consideration.[38]
3. **Authorial voice pattern.** Pattern 3 passages begin with "Levi said," "Jedaiah said," and so on – probably to distinguish the supercommentator's remarks from Ibn Rushd's statements that begin "I say" or "we say."
4. **Single question/doubt pattern.** Scattered questions (שאלות) and doubts (ספקות) interrupt the running commentary.
5. **Concatenated list pattern**. Here we have a sequence of question-answer or doubt-answer pairs, either numbered or linked by ועוד.
6. **Numbered lists patterns**. A list of numbered questions (שאלות, דרושים) or doubts (ספקות) or queries (קושיות) is followed by a list of answers (תשובות) or solutions (התרות). The questions usually, but not always, appear at the ends of chapters. In some commentaries, in addition to questions and answers, we find lists of didactic items such as כוונות, תועלות, שיעורים, and דרושים (not in the sense of questions).[39]

Pattern 4 is the basic question pattern and was common in the early commentaries. Ibn Rushd himself introduced questions by אם יאמר אומר or similar formulas.[40] Patterns 5 and 6 are rare in the early commentaries[41] on the *Physics* and are typical of the later ones.[42] To illustrate the use of the question patterns, I present examples from the late Spanish commentary P1 (infra, p. 197).

Examples of Pattern 4

- **Scattered questions (שאלות) and answers.** The question usually begins with "one should ask" or "if someone asks" (אם תאמר, אם תשאל, אם ישאלו, א"ת, יש לשאול, י"ל).
- **Scattered doubts (ספקות) and answers.** Sometimes a doubt follows an answer to a question: אלא שיש לזו התשובה ספק.[43]
- **Scattered queries (קושיות) and answers.** The query usually begins with יש להקשות.[44]

37 Three dots above the second word. These expressions are rare in books IV–VII of the second part.
38 See nn. 83 and 84.
39 This term had different meanings, for instance, in Ṭodrosi and in Gersonides.
40 E.g., Long Commentary on the *Physics,* MS Paris, BNF héb. 884, ff. 103b, 203a.
41 I have found only two examples of short lists in Ṭodrosi.
42 See infra, p. 188.
43 E.g., in MS P1, chapters I.1.2 and I.2.3.
44 E.g., in ibid., VIII.6.4.

The answers to all types of questions usually begin with “we answer” or “one should answer” (י"ל, יש להשיב, נשיב לזה, נשיב). Sometimes several answers are provided to a single question.[45]

Examples of Pattern 5

- Lists of queries and answers, linked by “one should raise another query” (עוד יש להקשות) or similar phrases: עוד איך אמר, עוד י"ל, and so on.[46]

Examples of Pattern 6 (usually at the Ends of Chapters)

- Numbered questions. Formula used: “this chapter has questions” (ויש בזה הפרק שאלות).[47]
- Numbered doubts. Formula used: “There are many doubts in this chapter” (הספקות אשר בזה הפרק הן רבות ועצומות).[48]
- Numbered queries. Formulas used: “there are queries about this chapter” (ובזה הפרק יש קושיות), “we should posit queries here” (ובכאן יש לעשות קושיות).[49]

The list of numbered answers is usually announced by “and we say in the resolution of these doubts” (ונאמר בהתרת אלה הספקות) or similar formulas. Sometimes questions appear in the middle of a chapter, opening with the phrase, “here are questions” (ובכאן שאלות),[50] followed by a sequence of numbered questions and answers.

I use these stylistic patterns to assess the development of the genre of the supercommentary from the fourteenth to the fifteenth century.

THE EARLY COMMENTARIES: PROVENCE, FIRST HALF OF THE FOURTEENTH CENTURY

Ibn Rushd’s Short Commentary on the *Physics* was translated, as mentioned earlier, by Moses Ibn Tibbon about 1250. The earliest commentaries on this translation known to us were written by Gersonides and Jedaiah ha-Penini about seventy years later.[51] Ibn Rushd’s Middle Commentary on the *Physics* was translated by Qalonymos ben Qalonymos in 1316; the first commentary on this translation, by Gersonides, is dated only five years later. The intensive study of the translated commentaries of Ibn Rushd and the trend of writing supercommentaries started to flourish in the fourteenth century.

Levi ben Gershom (Gersonides) and His Circle

The fourteenth-century scene in Provence was dominated by the figure of Levi ben Gershom (1288–1344), the great astronomer, mathematician, philosopher, and biblical commentator whose influence extended beyond Provence to Spain.[52] He is probably the originator of the supercommentary genre and certainly encouraged the study of Aristotle in the

45 E.g., in ibid., II.1.1.
46 E.g., in ibid., VI.7.
47 E.g., in ibid., I.1.1 and VII.1.
48 E.g., in ibid., VIII.5.1 and VIII.4.4.
49 E.g., in ibid., VIII.4.4, I.9, and III.3.5.
50 E.g., in ibid., I.2.4.
51 On the dating of these commentaries, see the following discussion.
52 Gersonides is mentioned in all of the Provençal commentaries on the *Physics*: those by ha-Penini, ha-Levi, and the anonymous commentary L/O. In Spain, Crescas was familiar with his interpretation of the *Physics*, and he is mentioned in the commentaries C1 and C3, which probably belong to the “Spanish circle.”

Jewish communities of southern France.[53] The most systematic Jewish commentator on Ibn Rushd, he wrote supercommentaries on the middle commentaries on the *Organon* that were available to him (the *Rhetoric* and *Poetics* had not yet been translated into Hebrew) and on all the short commentaries on natural science. He also began supercommentaries on the middle commentaries on the natural sciences[54] and on the long commentary on the *Metaphysics*, but these projects were discontinued. He probably also supervised students who wrote commentaries.[55]

Gersonides wrote two commentaries on the *Physics*: on the Short Commentary, dated June 1321, and on the Middle Commentary, dated June–July 1321. Both commentaries are extant in several manuscripts. His commentaries on the *Physics* illustrate that even the restrictive genre of the commentary can serve as a vehicle for the development of original and even revolutionary scientific theories.[56]

Jedaiah ha-Penini

- MS Parma, Palatina 2612, De Rossi 1399 (IMHM 13313) (beginning and end missing)

Ha-Penini, the son of the poet R. Abraham Bedersi, was himself a poet and also a scholar. He wrote a rather lengthy commentary on Ibn Rushd's Short Commentary on the *Physics*. This is the only commentary known to us that could have been written before those by Gersonides. Also extant are two letters in which he discusses a physical-cosmological question with an unknown "sage" whom he evidently considered to be his senior; I have argued at length that this sage was Gersonides.[57] If my argument is correct, then it is more likely that ha-Penini wrote his commentary about the same time or shortly after Gersonides wrote his.

There is no evidence that ha-Penini was acquainted with Arabic authorities other than Ibn Rushd. Mention of Jewish sources is also rare. There is one reference to Maimonides;[58] once he quotes "the sage R. Levi," probably Gersonides.[59]

R"S ha-Levi, a Student of Gersonides

- MS Oxford, Michael collection 538, Neubauer 1387 (IMHM 22411). Spanish script, 15th cent.

Although the author's name is not mentioned anywhere in the manuscript, the catalogue attributes it to R"S ha-Levi,[60] a student of Gersonides. He refers several times to "our teacher" (מורנו הרב), who has been correctly identified by Renan-Neubauer as Levi ben Gershom. Ha-Levi was acquainted with Gersonides' supercommentary on the Short Commentary on the *Physics* and disputes his interpretation on several occasions. Because he does not add ז"ל to Gersonides' name, we can conclude that this commentary was written not later than

53 Glasner, "Levi ben Gershom."

54 There is a complete commentary on the *Physics* and an incomplete one on *De caelo*.

55 It is likely that Urgul, Porfash, and Vital, dated by Steinschneider to the thirteenth century, were, as Neubauer and Renan suggested, Gersonides' students. See Glasner, "Levi ben Gershom."

56 See Ruth Glasner, "Gersonides on Simple and Composite Motion," *Studies in History and Philosophy of Science* 27 (1996).

57 Ruth Glasner, *A Fourteenth-Century Scientific Philosophical Controversy* (Jerusalem: World Union of Jewish Studies, 1998), pp. 15, 22–4 (in Hebrew).

58 Jedaiah ha-Penini, *A Commentary on Ibn Rushd's Epitome on the Physics,* MS Parma de Rossi 1339 (IMHM 13313), ff. 13^{a}15, 22 (in Hebrew).

59 Glasner, *A Fourteenth-Century Controversy,* p. 15.

60 MS Oxford, Bodl. Mich. 91, Neubauer 1387 (IMHM 22411), ff. 1–124. The end of the third book and the first two parts of the fourth are missing (f. 49a). Both Steinschneider and Renan-Neubauer assume that the author's name was mentioned on a page that was later lost. See Steinschneider, *Die hebräischen Übersetzungen*, pp. 110–11; Ernest Renan, *Les rabbins français du commencement du quatorzième siècle* (Paris, 1877), p. 580.

1344. I tend to think that it is early, because it is on the Short Commentary rather than the Middle Commentary. In addition to Gersonides, he also refers to Maimonides (הרב ז"ל) and to al-Ghazālī.

L/O (Probably Another Student of Gersonides)

- MS London, British Library Or. 1053 Margoliouth 1012/2 (IMHM 5932). Spanish script, 15th cent.
- MS Oxford Bodl. 2050/4 (Reggio Collection 44) (IMHM 19335). Spanish script, 15th cent.

This supercommentary of moderate length on Ibn Rushd's Middle Commentary is the first to include references to the Long Commentary.[61] It was written after Gersonides' death,[62] evidently by one of his pupils. It contains several quotations from Gersonides' commentary, without explicit credit.[63] The author mentions his teacher once; the reference confirms that it was indeed Gersonides.[64] Other texts mentioned are al-Ghazālī's *Intentions of the Philosophers*[65] and Maimonides' *Guide*.[66] In this commentary we find a report of an argument with an unknown disputant – perhaps a dialogue between student and teacher.[67] The author mentions the Arabic language twice[68] and the "language of the Christians" once.[69]

Ṭodros Ṭodrosi

- MS British Library Add. 27559, Margoliouth 890 (IMHM 6094). Spanish script, 15th cent.

Although Ṭodros Ṭodrosi was active in southern France in the 1330s, I have found no indications that he interacted with Gersonides' circle. Ṭodrosi's philosophical anthology from 1334 is a textbook whose aim is "to replace the long books and facilitate the study of these sciences."[70] In his introduction to the section on logic, Ṭodrosi announces his intention to collect excerpts from the works of Aristotelian philosophers – Themistius, Alexander, al-Fārābī, Ibn Sīnā, and al-Ghazālī – and from the commentaries by Ibn Rushd.[71] In the

61 MS London, Brit. Lib. Or. 1053, ff. $110^{b}21$, $144^{a}23$, $145^{b}9$, $149^{b}20$.

62 The London MS contains one reference to Levi ben Gershom, "blessed be his memory." The context is the discussion of the quadrature of the lunes. Gersonides' name appears in the title of a diagram. The Oxford manuscript omits the diagrams and the title. The author had Gersonides' supercommentary on the Middle Commentary on the *Physics* in front of him.

63 Our commentator quotes Gersonides verbatim. See

ואמנם יתנועע בתנועה מי שיש לו כח על התנועה משל לזה שלא יצמחו השמים ולא ישתנו מפני שאין להם זה הכח

(MS London Or. 1053, f. $158^{b}1$–3; and compare MS Paris BNF héb. 964/1, f. $127^{a}2$–4).

64 MS London Or. 1053, f. $71^{a}11$–15; MS Paris BNF, héb 964/1, f 5^{a} 7–11.

65 MS London Or. 1053, ff. $67^{b}13$–14, $71^{a}22$.

66 MS London Or. 1053, f. $163^{a}20$.

67 The argument concerns Ibn Rushd's use of the term "by conversion":

- And I told him that notwithstanding his rank (שחוץ מכבודו) it does not seem [correct] to me, because if it were so he should not have said "by the conversion of the obverse," but just "by conversion."
- And he replied that these are separate terms [according to MS London; MS Oxford: synonyms], but all is one.
- And I said that if it were as he said, he should have said "by conversion of the obverse" . . . (MS London Or. 1053, f. $147^{b}14$–17, MS Oxford 2050, f. $84^{b}11$–12).

68 Once (MS London Or. 1053, f. $88^{a}23$–25), following Ibn Rushd's Middle Commentary (MS Hamburg 264, f. $19^{b}24$); once he makes a comment of his own (f. $140^{a}9$–11).

69 MS London Or. 1053, f. $132^{a}8$–9: ובלשון הנוצרי יש שם לזה שמורה על מלת אם שר"ל אמת

70 MS London Brit. Lib. Add. 27559, f. 1a. The date is mentioned in the colophon, f. 207b.

71 Zonta, *La filosofia antica*, pp. 250–3; idem, "Fonte antiche e medievali della logica ebraica nella provenza del trecento," *Medioevo* 23 (1997): 515–94, on pp. 527–9; idem, "The Role of Avicenna and of Islamic 'Avicennism'

section on physics, however, he relies mainly on Ibn Rushd.[72] This section consists of two parts.

Part 1 (ff. 94a–115b) is a summary that covers only some of the subjects discussed in the *Physics*. Ṭodrosi declares his intention to collect and abridge some of the commentaries.[73] He starts with the prooemium of the Long Commentary, after which he devotes about two and a half small pages to each of the eight books. Some passages are taken from Ibn Rushd's Long Commentary, which he calls the פרישה. Part 2 (ff. 115b–207b) is a full commentary, based on Ibn Rushd's Middle and Long Commentaries, as Ṭodrosi had promised.[74] The running quotations are from the Middle Commentary, but Ṭodrosi also consulted the Long Commentary.[75] He makes a clear distinction between Aristotle's words and those of Ibn Rushd. There are few explicit references to other commentators not mentioned by Ibn Rushd. Ṭodrosi was interested in Alexander and quotes him often, but all the quotations are taken secondhand from Ibn Rushd's Long Commentary,[76] as are the references to Galen.[77] Ṭodrosi also refers to Ibn Sīnā several times[78] and to al-Ghazālī's *Tahāfut*.[79]

Narboni's Lost Commentary

Moses Narboni, born in Perpignan and active both in Provence and in Spain between 1342 and 1361, was the last early-period commentator on the *Physics*. In the introduction to his commentary on the *Natural Questions* (דרושים טבעיים), he states that he wrote it after completing a commentary on the *Physics*.[80] Steinschneider identified the latter with the anonymous commentary preserved in MS Paris BNF héb. 967/1, to which I refer later as P1. I have shown that P1 is not by Narboni.[81] It seems rather to belong to the "Spanish circle" and is addressed in the section on those commentators. Narboni's commentary seems to be lost.[82]

The Style of the Early Commentaries

After the reassignment of the typically scholastic commentary P1 to the fifteenth century, the map of the Hebrew commentaries becomes clearer. There are two main groups: the early commentaries, written in Provence in the first half of the fourteenth century, and the late commentaries, composed in Italy, Byzantium, and Spain in the second half of the fifteenth century. The early and late commentaries differ significantly in style. The early commentaries usually employ the simple patterns (1–4).

in the 14th-Century Jewish Debate around Philosophy and Religion," in *Oriente Moderno* n.s. 19 (2000): 647–60, on pp. 653–5. Zonta identifies long quotations from Ibn Sīnā, as well as from al-Ghazālī and al-Rāzī, and remarks that "no other Jewish philosopher of that time and milieu" expresses similar interest in Ibn Sīnā.

72 He follows Ibn Rushd's two commentaries. In the famous argument between Ibn Sīnā and Ibn Rushd on the role of metaphysics in establishing the basic premises of the sciences, he sides with Ibn Rushd (MS London, Brit. Lib. Add. 27559, f.100b).

73 F. $94^{a}6$–9.

74 F. 115a.

75 Explicit references are introduced by לשון ב"ר בפרישה (e.g., ff. $126^{a}13$, $154^{b}4$, $184^{a}23$, $190^{a}15$).

76 Ff. 145a, 146b, 163a, 95a, 101b, 107a, 108a, 115b, 116a, 138a, 140b, 154b, 204a.

77 F. 168a–b.

78 Ff. $103^{a}21$ (reference to the *Shīfāʾ*), $196^{b}5$, $204^{a}11$.

79 F. $176^{b}23$.

80 Gitit Holtzman, "The Theory of the Intellect and Soul in the Thought of Rabbi Moshe Narboni," Ph.D. dissertation, Hebrew University of Jerusalem, 1996, p. 4 (in Hebrew).

81 Ruth Glasner, "Two Notes on the Identification of Some Anonymous Hebrew Commentaries on the *Physics*," *Aleph* 9 (2009): 335–44.

82 None of the anonymous works I examined seems to be by him.

Gersonides was probably the first Jewish scholar to write supercommentaries, and we can see that he experiments with the simple patterns. Sara Klein-Braslavy has shown that he uses both of the quotation patterns, 1 and 2, sometimes in the same work.[83] Charles Manekin, who studied Gersonides' *Commentary on Logic*, showed that from the end of *De interpretatione* to the *Topics*, he gradually shifted from Pattern 1 to Pattern 2.[84] Pattern 3, in which the author speaks in his own voice, emerged gradually in Gersonides' commentaries. At first he used it to provide a running commentary on the quoted text or even to paraphrase it.[85] Gradually it became a medium for expressing his own views or for discussing problems in the text.[86] Gersonides also uses Pattern 4, the simple question pattern. He discusses questions he found in Ibn Rushd[87] and introduces questions (שאלות), doubts (ספקות), and queries (קושיות) of his own. The formulas below represent all his philosophical commentaries, and not only those on the *Physics*.[88]

וכבר יפול ספק, הנה יפול ספק, וכבר ישיג ספק, ובכאן ספק אינו מעט, ובכאן ספק מה, ובזה הענין נקשה, על כך יש להקשות,
יש לשואל שישאל, ואם אמר אומר, ויש לאומר שיאמר, ואולי יספק המספק, וכבר יספק מספק, אלא למספק שיספק

Of the quoting patterns, Gersonides' student ha-Levi uses only Pattern 1, as did his students who wrote commentaries on other books by Ibn Rushd.[89] Ha-Penini uses mainly Pattern 2; his presentation of Ibn Rushd's text is repeatedly interrupted by rather long explanations and additions of his own. The extant part of his commentary includes fifteen Pattern 3 passages, most of them discussions of difficulties.[90] Ṭodrosi introduces Pattern 3 passages by אמר טודרוס, אמר טודרוס המעיין,[91] אמר המחבר,[92] or ונאמר אנחנו.[93] The role of these passages is not always clear.[94] Ṭodrosi also introduces questions with וכבר ישאל שואל,[95] וכמו כן יסופק,[96] וכבר יספק מספק,[97] or ולמה שהיה לאומר שיאמר.[98]

A simple instance of the scholastic Pattern 6 is found for the first time in Ṭodrosi. In the section of his anthology on physics, he twice uses short lists: a list of two doubts followed by two answers[99] and a list of four *derušim* summarizing book VI.[100] I leave the word *deruš*

[83] Sara Klein-Braslavy, "La structure des commentaires et la manière de commenter les textes," in Sirat, Klein-Braslavy, and Weijers, eds., *Les méthodes de travail de Gersonide*, pp. 73–89. On the commentaries on the *Physics*, see p. 77.

[84] Manekin, "Gersonides' Logical Writings," pp. 95–6.

[85] In the supercommentary on the Middle Commentary on the *Physics*. See Klein-Braslavy, "La structure," p. 79.

[86] Still, it should be emphasized that original views are not always confined to Pattern 3 passages. Readers of Gersonides' commentaries should not skip from one "Levi said" passage to the next, not even those well acquainted with Ibn Rushd's text.

[87] For instance, in the supercommentary on the Short Commentary on the *Physics*, MS Vatican ebr. 342/1 (IMHM 431), 23^b5–24^a12 (Ibn Rushd's text 24^a15); 55^a21–b4; 59^b15–60^a1; 60^a13; 63^a13–18; Middle Commentary on the *Physics*, 42a–43a, 64a, 98a–99b, 102a–103b, 134a–135a, 146^b26.

[88] The list of references is too long to include here.

[89] See Glasner, "Levi ben Gershom," pp. 61–5.

[90] Of these fifteen passages, twelve concern difficulties. In three passages ha-Penini admits "confusion and doubts" (ff. 11a, 34b, 170b); in nine he comments on textual problems (ff. 91a, 100a, 174a, 188a, 198a).

[91] MS London Brit. Lib. Add. 27559, ff. 161^b6, 184^b2, 190^a12, 191^a9.

[92] F. 158^b5.

[93] F. 204^a23.

[94] Sometimes the *ʾamar Ṭodros* passages begin *ʾamar Ibn Rushd* (191^a9, 194^b5).

[95] MS London Brit. Lib. Add. 27559, ff. 104^a8, 155^a11, 189^a6.

[96] Ff. 156^a17, 19.

[97] F. 164^b19.

[98] F. 199^a10.

[99] MS London, Brit. Lib. Add. 27559, f. 203^b13–15, 17. A discussion of the two doubts follows (ff. 204a–205b).

[100] MS London, Brit. Lib. Add. 27559, ff. 110^b23–111^a5.

untranslated because commentators used it in at least two senses; for Ṭodrosi it meant "subject" or "issue."

The conclusion seems to be that the early commentators used the simple patterns almost exclusively. As I note in the conclusion, however, the picture is somewhat more complex.

THE LATE COMMENTARIES: SECOND HALF OF THE FIFTEENTH CENTURY

To judge by the evidence of the extant manuscripts, the second wave of Hebrew commentaries on the *Physics* began about the middle of the fifteenth century. Those that have come down to us are from Byzantium, Italy, and Spain. Mauro Zonta characterizes Jewish philosophy in the second half of the fifteenth century in Spain and Italy as "scholastic."[101] In the commentaries on the *Physics*, the scholastic tendency is manifest mainly in the use of Patterns 5 and 6 and, in a few cases, in the presence of quotations from Christian sources. As we will see, the late commentaries on the *Physics* are scholastic in different manners and to different degrees.

The Byzantine Circle

Three commentaries from Constantinople and Candia, written somewhat after the middle of the fifteenth century, have come down to us. They are textual commentaries on Aristotle's text as quoted in books I–IV of Ibn Rushd's Long Commentary, with occasional references to Ibn Rushd's comments. There is no evidence that books V–VIII were available in Byzantium. In this section, I adduce evidence that there were connections among the commentators and, accordingly, refer to them as a circle.

Shalom Anavi: Commentary on the Long Commentary, Books I–IV

- MS Paris, BNF héb. 983/14 (IMHM 30343), ff. 105a–267a. Byzantine script, 15th cent.

Zonta suggests that this commentary was written in Constantinople around 1450–60.[102] It is basically a Pattern 2–3–4 textual supercommentary on Aristotle's text as quoted in Ibn Rushd's Long Commentary.[103] It quotes the entire text of Aristotle.[104] However, Anavi does not use the Long Commentary only to extract Aristotle's text from it. He starts with a discussion of Ibn Rushd's prooemium, which he calls the העצה; when discussing the Philosopher's text, he consults the commentator's comments. There are a number of *ʾamar Shalom* passages.[105] At the end of several chapters, Anavi introduces questions using various formulas: a question (שאלה) and an answer (תשובה)[106] and "if someone argued . . . we would answer"

[101] See Mauro Zonta, "The Autumn of Medieval Jewish Philosophy: Latin Scholasticism in Late 15th-Century Hebrew Philosophical Literature," J. A. Aersten and M. Pickavé, eds., *Herbst des Mittelalters* (Berlin: de Gruyter, 2004), 474–92; idem, *Hebrew Scholasticism in the Fifteenth Century: A History and a Source Book* (Dordrecht: Springer, 2006).

[102] Giuliano Tamani and Mauro Zonta, *Aristoteles Hebraicus* (Venice: Supernova, 1997), p. 39.

[103] Anavi does not number the texts, but marks them by the word הפרק with three dots above the word. In the beginning of the Hebrew translation of the Long Commentary, there is a division into *kelalim* and *peraqim*. This division is discontinued in book II. Anavi follows it only until the first *pereq* of the second *kelal*, namely, comment 6.

[104] He quotes the text or the beginning of the text, and then comes 'הפי, namely, הפירוש 'the commentary.' If he does not quote the whole text at the beginning, he provides it later, usually broken up into several quotations.

[105] MS Paris, BNF héb. 983, ff. 197b, 199^{b}1–7, 200b, 201a, 203a, 206b, 259b.

[106] Ibid., ff. 108b, 136b (question introduced by *ʾamar šalom* followed by an answer), 127b, 228a–b.

(וא"ת – הנה נשיב, ולו יטען טוען – הנה נשיב).[107] The Jewish authors referred to are Maimonides and Isaac Israeli.[108] At least one Arabic term is mentioned.[109]

Michael Kohen: Two Incomplete Commentaries on the Long Commentary, Books I–II

- MS Vatican ebr. 344 (IMHM 433). Byzantine semi-cursive script, mid-fifteenth century (autograph)[110]

The title announces a commentary on the *Physics*, but the manuscript actually contains two incomplete commentaries.

FIRST COMMENTARY (BEGINNING–F. 18B). The manuscript begins "*Physics*, from what I heard Michael Kohen [*sic*]."[111] The commentary begins with a few short quotations from Ibn Rushd's prooemium to the Long Commentary and continues as a Pattern 1 textual commentary on Aristotle's text, as found in the Hebrew translation of the Long Commentary. The short quotations are introduced by the words אמ' ארסטו, sometimes abbreviated as א"א, and then ר"ל and the commentary. Unlike Anavi's, this commentary does not cover Aristotle's entire text. In his comments the author sometimes quotes sentences from Ibn Rushd, introduced by "from the words of Ibn Rushd" (מדברי אבן ראשד). This commentary breaks off after the first page of book II.

SECOND COMMENTARY (F. 19A–END). The second commentary is a word-for-word copy of Shalom Anavi's commentary, except that *ʾamar Shalom* is replaced by *ʾamar Mika̱ʾel*. Even the graphic presentation is the same.[112] The commentary breaks off in the middle of book II. Parts of it are unreadable. Is this a blatant case of plagiarism? Did Michael start to write a commentary of his own, only to decide after the first book that it was more convenient to "borrow" Anavi's?[113]

Who was Michael Kohen? The new Vatican catalogue identifies him as Michael ben Elijah Kohen of Candia, who is also responsible for MS Vatican ebr. 345, an autograph written in Candia in 1451.[114] Another possibility is that he was Michael ben Shabbetai Kohen Balbo, who copied or wrote parts of MS Vatican ebr. 105 – a collection of texts, some from the 1470s.[115] We know that he corresponded with Shalom Anavi.[116]

Two Unidentified Fragments in Byzantine Script. There is not enough information to identify these fragments. I list them here because they are in Byzantine script.

- MS Vatican ebr. 102/4 (IMHM 214), ff. 269a–270b. 14th–15th cents.

This fragment contains Ibn Rushd's Middle Commentary on *Physics* VI, chapters 2, 3, 8, and 9. The author uses short quotations followed by ר"ל.

- MS Paris, BNF héb 1005/4 (IMHM 30347), f. 19a–b. 15th cent.

107 Ibid., ff. 138a, 149a, 150a, 243b.
108 Ibid., ff. 178a.
109 Ibid., ff. 199a, 211b. Anavi mentions the Arabic name of the star Sirius.
110 I am grateful to Benjamin Richler for his help with these texts and for sending me the relevant pages from the new Vatican catalogue.
111 MS Vatican ebr. 344 f. 3a.
112 The use of the word הפרק with three dots above it follows Anavi's commentary precisely.
113 It is unlikely that Shalom Anavi "borrowed" Michael Kohen's commentary because the latter is an autograph and is incomplete.
114 I am grateful to Rachel Nissan of the Institute of Microfilmed Hebrew Manuscripts for comparing manuscripts 344 and 345 and confirming that they were written by the same hand.
115 For example, item I.9 mentions the date 1471, item I.10, the date 1473.
116 Item I.7 in MS Vatican ebr. 105 includes a philosophical correspondence between Michael Kohen, Shalom Anavi of Constantinople, and Jedidiah ben Joseph of Rhodes. Item II is a treatise by Shalom Anavi copied by his son Joseph; item IV is a text copied by Michael Balbo.

This brief text begins, “Now I shall write part of the definitions of special concepts, as Aristotle defined them in his book called the *Physics*.” This is followed by definitions of nature, place, motion, and time. This text does not rely on Ibn Rushd, and none of the definitions follows Aristotle’s exact words.[117]

Conclusion. The suspected plagiary and the correspondence between Michael ben Shabbetai ha-Kohen and Shalom Anavi show that there were scholarly ties between the Jewish communities of Candia and Constantinople; thus we can refer to them as a circle of Byzantine Jewish commentators. It is possible that the two Jewish communities possessed two copies of books I–IV of Ibn Rushd’s Long Commentary or that they shared or copied one manuscript thereof.

Italy

Judah Messer Leon and His School[118]

- MS Milan Ambr. 79 (S 38 Sup.) (IMHM 14615), book I
- MS Budapest, Theological Seminary K. 96 (IMHM 47081), book I
- MS Moscow, Guenzburg 396 (IMHM 47752), parts of book II
- MS Cambridge Add. 631, second part of book II (IMHM 16855).
- MS Milan Ambr. 80 (Q 24 Sup.) (IMHM 14602), book III incomplete

This monumental commentary, whose parts are preserved in the manuscripts listed here, has been studied by Mauro Zonta, who identified the author as Judah Messer Leon.[119] According to Zonta, Messer Leon was the most prominent of the “Hebrew schoolmen” who followed the Christian schoolmen of the University of Padua.[120] Active in the second half of the fifteenth century, he wrote his commentary on the *Physics* in Mantua between 1473 and 1475.[121] Of all the Hebrew commentaries on the *Physics*, this is by far the most scholastic in form and content and the one that relies most heavily on Latin sources.[122]

This commentary has a unique and complex structure. It includes Aristotle’s text, quoted from the Long Commentary, passages from the Middle Commentary, and a “Christian version,” which is a Hebrew translation of William of Moerbeke’s Latin translation of Aristotle.[123] The main part consists of *derušim* and *šiʿurim*.[124] Here *deruš*, used by Ṭodrosi in the sense of “subject” or “issue,”[125] denotes the scholastic *quaestio*.[126] The *quaestio* is followed by a typical scholastic argument that presents the arguments for and against. The *šiʿurim* are comments on the different texts.[127] There are references to various Muslim and Christian scholars.

- MS Paris, BNF héb. 994/7 (IMHM 14679), ff. 116–39. Italian script, dated 1488

117 Most interesting is the definition of motion, which follows *Physics* VI (motion is from something to something) rather than the well-known definition of book III (motion is the perfection of potential qua potential).

118 In this section I depend totally and completely on the work of Mauro Zonta. I am grateful to him for his assistance.

119 Mauro Zonta, *Hebrew Scholasticism*, ch. 4; idem, “Aristotle’s *Physics* in Late-Medieval-Jewish Philosophy (14th–15th Century) and a Newly-Identified Commentary by Yehudah Messer Leon,” *Micrologos* 9 (2001): 203–17; idem, “Scholastic Commentaries in Hebrew: Some Notes about Judah Messer Leon (Italy, Fifteenth-Century),” in Gianfranco Fioravanti et al., *Il commento filosofico nell’occidente latino* (Turnhout: Brepols, 2002), pp. 379–400.

120 Zonta, *Hebrew Scholasticism*, p. 211.

121 Ibid., p. 27.

122 Ibid., pp. 267–72.

123 See ibid., p. 216.

124 An example was published and translated by Zonta: ibid., pp. *34–*51 (text) and pp. 267–71 (translation).

125 See n. 100.

126 For a list of the questions discussed in the commentary, see ibid., pp. 272–9.

127 E.g., שעור נסחת בן רשד, שעור הנסחא הנוצרית, שעור האמצעי

This is not a textual commentary. It is structured as a book of consequences (תולדות), a central concept in scholastic logic. It begins התולדה הראשונה ממאמר ראשון מספר השמע. Zonta notes a similarity with Walter Burley's *Expositio in octo libros Physicorum* and suggests that the text may have been written or translated by Messer Leon.[128]

- MS Firenze, Biblioteca Laurenziana Pluteo I.26/19 (IMHM 17644), ff. 141b–162a. Italian script, 15th or 16th cent.

The Florence manuscript deals with books I–II of the *Physics* and adds a few remarks on infinity (book III) and place (book IV). Zonta identifies it as a supercommentary on the previous text and ascribes it to a student of Messer Leons.[129] Passages are ascribed to Aristotle (הפילוסוף), to the author (המחבר), and to the translator (המעתיק). Italian is used in one place.[130]

Other Italian Commentaries

- MS New York, JTS 2457/2 (IMHM 28710). Spanish script, 16th cent., perhaps from Byzantium

This commentary opens with a short quotation from Ibn Rushd's prooemium to the Long Commentary and then continues as a supercommentary on the Middle Commentary on books I–VI, using Patterns 1 and 4. Questions are introduced by וא"ת–נשיב[131] or תשובה – שאלה.[132] It is less typically scholastic than the commentaries by Messer Leon and his students. The Arabic scholars al-Ghazālī[133] and al-Fārābī[134] are mentioned; so are Maimonides[135] and Shem Ṭov Ibn Falaquera.[136] The author uses several Italian words: *perspectiva* (פרישפקטיוה), *geometria*, and *musica*.[137] He translates הזדמן as *fortuna*[138] and זבובים as *mosca*.[139] He renders the expression צד הלימוד as *dallo procedere* (דלופרוצידירי).[140] He refers to Alexander sometimes according to the common Arabic spelling אליסכאנדר[141] and sometimes as אליסנדרו,[142] following the Italian pronunciation.

The Spanish Circle

The middle and the second half of the fifteenth century in Spain was a period of reaction to the anti-rationalistic trend that spread among Spanish Jews after the riots of 1391. Hava Tirosh-Samuelson calls it a period of cultural rebuilding.[143] On the one hand, she writes, the Spanish Jews revived the genre of the commentary "to ensure the perpetuation of the authoritative Judeo-Arabic philosophical tradition"; on the other hand, they recognized

[128] Ibid., p. 212.
[129] Ibid., p. 213.
[130] המופת, פי' הראייה, פרובה בלעז.
[131] E.g., MS New York JTS 2457, ff. 93^a8, 12, 14, 93^b6, 100a.
[132] E.g., ibid., f. 112a.
[133] He refers to al-Ghazālī's logic (ibid., f. 93^b7), his metaphysics (f. 94^b24), and his natural science (f. 114^a3).
[134] Ff. 122–4.
[135] With a reference to *Millot ha-higgayon*, f. 106^a5.
[136] F. 132a.
[137] F. 106^a5, 6, 11, 16, 18.
[138] F. 107^a24.
[139] F. 110^a7.
[140] Namely, "by way of proceeding" (f. 94^a18). I am grateful to Caterina Rigo, who helped me decipher this expression.
[141] F. 133^a4.
[142] F. 134^a24, 25.
[143] Hava Tirosh-Samuelson, "Medieval Jewish Philosophy on the Eve of Modernity," in Daniel H. Frank and Oliver Leaman, eds., *History of Jewish Philosophy* II (London: Routledge, 1997), pp. 499–573, on p. 503.

the need to face the challenge of Christianity.[144] “In their pursuit of a renewal of Jewish philosophy . . . some Jewish philosophers showed a remarkable interest in the doctrines and methods of contemporary Latin scholasticism.”[145]

We have several extant commentaries on the *Physics* from the second half of the fifteenth century in Spain: one by Shem Ṭov ben Joseph Ibn Shem Ṭov and two more that are probably by his uncle, Isaac Ibn Shem Ṭov. The story of the Shem Ṭov family reflects the changing mood among Spanish Jews in the last decades before the expulsion. Shem Ṭov Ibn Shem Ṭov (1380–1441) was a great opponent of philosophy. His two sons Joseph and Isaac, as well as Joseph’s son Shem Ṭov, switched to the philosophers’ camp.[146] I believe that the uncle and nephew, along with several others who wrote commentaries on the *Physics,* belonged to a circle of Spanish scholars. This circle possessed a complete copy of Ibn Rushd’s Long Commentary.

The main evidence is preserved in the libraries of Paris and Cambridge. I begin with MS Paris BNF héb. 967, to which I refer as P. This valuable manuscript contains the only extant copies of two important complete commentaries on the *Physics*: P4, by Shem Ṭov ben Joseph Ibn Shem Ṭov, and P1, which Steinschneider erroneously ascribed to Narboni.[147]

P1

- MS Paris, BNF héb. 967/1 (IMHM 30339): Hard-to-read Spanish cursive script, 15th cent. Book V and the first six chapters of book VI are missing.

P1 is a rather long, typically scholastic commentary of 108 densely written folios. I used it earlier to illustrate all the question patterns. Steinschneider’s attribution of P1 to Moses Narboni is mistaken.[148] The author follows Qalonymos’s translation of the Middle Commentary using Pattern 1 quotations; he also had a copy of the Long Commentary to hand and quotes it several times.[149] There are three “Moses said” passages in the commentary.[150] These are not Pattern 3 passages, but quotations from Narboni’s commentary on Ibn Rushd’s *Natural Questions.*[151] There are also references to al-Ghazālī.[152]

[144] Ibid., pp. 503–4.

[145] Zonta, “The Autumn,” p. 474; Ari Ackerman, “Jewish Philosophy and the Jewish-Christian Philosophical Dialogue in Fifteenth-Century Spain,” in Daniel H. Frank and Oliver Leaman, eds. *The Cambridge Companion to Jewish Philosophy* (Cambridge: Cambridge University Press, 2003), pp. 371–90.

[146] On Joseph Ibn Shem Ṭov, see Shaul Regev, “Theology and Rational Mysticism in the Writings of R. Josef Ben Shem Ṭov,” Ph.D. dissertation, Hebrew University of Jerusalem, 1983 (in Hebrew).

[147] P2 is a commentary on *De anima*; according to the catalogue, it may be by Shem Ṭov ben Joseph Ibn Shem Ṭov. Between P1 and P2 there is a single page (f. 109b) of notes in a different hand, which do not seem to refer to P1. Perhaps they refer to P2. Among these comments there is a brief one by Shalom Anavi. Anavi lived about the same time in Byzantium. Is it possible that he had access to one of the commentaries of the Spanish circle? The notes on f. 109b require further investigation.

[148] See Glasner, “Two Notes.”

[149] E.g., chapter VII.2 (MS Paris, BNF héb. 967/1, f. $76^{b}15$–20) quotes from the Long Commentary (MS Cambridge-Harvard 40, f. $109^{a}2$–6). In chapter II.1.1 (f. $17^{b}11$) he quotes Ibn Rushd’s Long Commentary: לפי שהוא אמר למעלה שהטבע הוא התחלה למה שיתנועע וינוח.

[150] The first paragraph of chapter VII.1 (f. $72^{a}2$–10); the last paragraph of chapter VII.1 (f. $74^{a}16$–25); the first paragraph of chapter VII.2 (f. $74^{a}25$–b21).

[151] The first paragraph (MS Paris $72^{a}2$–4) is a quotation from Narboni’s commentary on Ibn Rushd’s *Natural Questions* (MS Vatican Urb. 41 [IMHM 680], ff. $101^{b}28$–$102^{a}1$). The second paragraph (MS Paris $74^{a}16$–25) is a quote from MS Vatican, f. $103^{b}90$–18; the third (MS Paris $74^{a}25$–b21), from MS Vatican, f. $104^{a}12$–18. The rest of the third passage more or less follows MS Vatican $104^{a}18$–b10. In the second passage in the *Natural Questions,* Narboni refers to his lost commentary on *Physics* VII: “And in the seventh book of the *Physics* we have explained what cannot be omitted here” (MS Vatican, $103^{b}9$). In addition to the three *ʾamar Mošeh* passages, there is one more reference to the *Natural Questions* in chapter VIII.4.4 f. 93b.

[152] Chapter IV.3.4 (f. 61b).

P4: Shem Ṭov ben Joseph Ibn Shem Ṭov

- MS Paris, BNF héb. 967/4 (IMHM 30339). Spanish script, 15th cent.

P4 is complete and runs to 138 large folios. The author is named at the beginning. Shem Ṭov comments on Ibn Rushd's Middle Commentary and consults the Long Commentary.[153] He uses Patterns 1, 4, and 5 and introduces quotations with אמר or with ע"א (= עוד אמר) and questions with א"ת[154] or י"ל.[155] He does not number questions, but sometimes concatenates them with the formula עוד י"ל – ונשיב.[156] There are explicit references to a Christian commentator, Thomas Aquinas (טומש).[157] Other, more conventional, references are to al-Ghazālī, Ibn Sīnā, Maimonides,[158] and Crescas, whom Shem Ṭov calls "Ibn Ḥasdai."[159]

Shem Ṭov ben Joseph Ibn Shem Ṭov and Others

- MS Paris, BNF héb 1004 (IMHM 14689). Spanish script, 15th–16th cent.

This manuscript contains several independent treatises, copied by several hands. Most deal with topics that are classified as physics (i.e., subjects that Aristotle addressed in his *Physics*). One independent treatise is a chapter from a commentary; others also use commentary styles. Apparently when the requirement to cover the whole text (whether Aristotle's or Ibn Rushd's) was gradually abandoned, the border between a commentary and an independent treatise became somewhat fuzzy. Several of the treatises are by Shem Ṭov ben Joseph Ibn Shem Ṭov; others, too, seem to have been written in fifteenth-century Spain.

- 1004/7, ff. 97a–102a, commentary on "everything that is moved is divisible"

This anonymous treatise is actually chapter VI.7 of Shem Ṭov ben Joseph Ibn Shem Ṭov's commentary on the *Physics* (P4, ff. 302^{a}18–307^{b}3). This copy does not include the list of doubts that follows Shem Ṭov's presentation of the chapter. It is a very good example of the "fuzzy border" between the commentary genre and the independent treatise.

- 1004/4, ff. 60a–74a, "Commentary on the material principle," attributed to Shem Ṭov ben Joseph

This treatise claims to be a summary of what had been written on the subject of first matter. It begins with three "lessons" (תועלות) to explain why the subject is important. They are followed by seven chapters, which include several texts of Aristotle quoted from Ibn Rushd's Long Commentary on the first book of the *Physics*.[160] Shem Ṭov also quotes Ibn Rushd and Narboni from the latter's commentary on the former's *Natural Questions*.[161] The seventh chapter is followed by "The Treatise on Doubts" (המאמר בספקות),[162] which consists of nine numbered question-answer units, followed by "Comments" (הערות).[163]

153 E.g., ff. 229^{a}22–3, 311^{b}1–3, 317^{a}10, 320^{b}21, 332^{a}27.

154 E.g., ff. 206b, 233a, 236b, 243a, 246b.

155 E.g., ff. 237a, 242a, 242b, 248a, 254b, 255a, 256a–b.

156 E.g., ff. 241^{a}6, 10, 12, 17, 18, 23, 26; 245^{b}7, 10, 14, 17; 250^{b}9, 11, 15, 16, 22; 251^{a}1, 2, 7, 9, 10, 13, 15, 20, 23; 251^{b}3, 5, 6; 252^{a}3, 13.

157 Ff. 222^{b}5, 235^{b}15, 265^{b}11, 15.

158 F. 222^{b}3.

159 Ff. 245a, 308^{b}20.

160 E.g., in chapter 5 (f. 63^{b}4–9) Shem Ṭov quotes comment 70 from book I of Ibn Rushd's Long Commentary.

161 In chapter 6 (f. 64^{b}10) Shem Ṭov quotes from Ibn Rushd's *Natural Questions* and from Narboni's commentary on this text. See MS Vatican Urb.41 [IMHM 680], ff. 92^{b}8, 93^{a}5ff.

162 Ff. 67^{a}23–72^{b}14.

163 F. 72^{b}15.

- 1004/1: Anonymous treatise on the multiplicity of forms; the catalogue suggests Abraham ben Shem Ṭov Bibago as the author
- 1004/8, ff. 102b–106a: Anonymous treatise on the body

These are two treatises on basic concepts at the border of physics and metaphysics. The first is a discussion of several claims (טענות) related to the concepts of matter, corporeal form, and elemental forms. It also includes questions introduced by ואם תאמר, ואם ישאל שואל, ואם יטעון טוען, or ואם יאמר אומר. The second presents the concepts of matter, corporeal form, and natural (or elemental) form, followed by three doubts. The author refers to Ibn Rushd's Short Commentary on the *Metaphysics*.

- 1004/9. f. 106a. A Hebrew translation from the Latin of Robert of Lincoln's *Treatise on the Physics*[164]

This treatise consists of eight short summaries of the eight books of the *Physics*. It presents a few doubts.[165]

Isaac ben Shem Ṭov and the Commentaries Attributed to Him
- M/C: MS Munich 45 (IMHM 1139), Ashkenazi script, 16th cent.

MS Cambridge 6.25 (IMHM 15830) consists of two distinct parts. Both are in Spanish script of the fifteenth to sixteenth century, but the second is in a different hand and numbered from the beginning. M/C1 includes books I–IV; M/C2 includes books V–VIII.

- C1–C3: MS Cambridge, Trinity College 8.19 (IMHM 12609), Spanish script, 15th cent.

This manuscript includes three anonymous commentaries on the *Physics*, copied in the same hand.[166] I refer to them as C1, C2, and C3.

M/C is a rather bulky commentary. The Cambridge manuscript consists of two distinct parts, which deal with books I–IV and V–VIII, respectively. M/C1 comprises 136 large folios, M/C2, another 111 large folios. MS Munich consists of 377 medium-sized folios. In the Munich manuscript, the commentary is ascribed to al-Bulaq (אלבולק) in the title. The name of the author, Isaac, appears many times in the text (אמר יצחק). Steinschneider suggested that the author might have been Isaac Albalag, who lived in Spain in the thirteenth century.[167] Wolfson demonstrated that this attribution is clearly wrong and assigned the commentary to Isaac Ibn Shem Ṭov.[168] He also attributed to Isaac Ibn Shem Ṭov the three commentaries (C1–C3) found in MS Cambridge Trinity College 8.19 – making a total of four commentaries on the *Physics*.

Wolfson's first argument is persuasive. Steinschneider relied only on MS Munich, whereas Wolfson found another manuscript of this commentary in Cambridge. The Cambridge manuscript includes two more commentaries (on *De anima* and *De gen. el corr.*) written in the same hand, which also include "Isaac said" passages. The full name of the author is not mentioned in the manuscript, but in the colophon, dated 1471, the copyist introduces himself as a student of Isaac Ibn Shem Ṭov's. Wolfson accordingly identified him as the

[164] The author is referred to in the colophon: נשלם ספר ליקוניאישיש.
[165] E.g., ff. 111^a16, 111^b4, 114^b17.
[166] See Steinschneider, *Die hebräischen Übersetzungen*, p. 121.
[167] Ibid., p. 116.
[168] H. A. Wolfson, "Isaac Ibn Shem Ṭob's Unknown Commentaries on the *Physics* and His Other Unknown Works," in *Studies in Jewish Bibliography and Related Subjects in Memory of Abraham Solomon Freidus* (New York: Alexander Kohut Memorial Foundation, 1929), pp. 479–90. See also idem, "Note on Crescas' Definition of Time," *Jewish Quarterly Review* 10 (1919–20): 1–17, p. 16n.

author of the commentary on the *Physics*. This is very plausible, though the name al-Bulaq poses a problem.

Wolfson's second argument is hasty.[169] He based his attribution of C1–C3 to Isaac Ibn Shem Ṭov on the references he found in M/C1 to "our first commentary" (ביאורנו הראשון). Wolfson studied these references and showed that they may refer to C3. Relying on the comparison of the passages, he suggests that C2 may be also by Isaac and adds C1 to this "package deal,"[170] assuming that the three commentaries are related. His error was that he examined only M/C1 but not M/C2.[171] A look at the two parts of M/C shows that Isaac did indeed write two commentaries on the *Physics*. M/C1 contains books I–IV of the late commentary, M/C2, books V–VIII of the early commentary. MS Munich includes all eight books of the later commentary, but seems to be a copy of an earlier redaction or a defective copy of this text.[172]

The comparison of Isaac's two commentaries is highly relevant to our subject because of the dramatic shift to a scholastic style. The early commentary (of which only books V–VIII survived in M/C2) is a conventional textual commentary based on Ibn Rushd's Middle Commentary. The quotations follow Pattern 1. Of the question patterns, only the simplest, Pattern 4, is used from time to time. The formulas that introduce questions are יש למספק שיספק, יש לאומר שיאמר, אם יאמר אומר and the like. The "old-fashioned" Pattern 3 appears more frequently in the earlier commentary than in the later one.[173]

The later commentary (of which books I–IV are preserved in M/C1 and the full text in MS Munich) is an exercise in scholastic writing. The standard references are to Aristotle, rather than to Ibn Rushd. Each chapter begins with the formula, "Aristotle's intention in the chapter." Only some of the chapters incorporate quotations from Ibn Rushd's Middle Commentary.[174] The core of the chapter is usually the presentation of doubts using the scholastic Patterns 5 and 6.[175] Standard formulas are

> הספקות שיש בזה הפרק, ואחר אשר בארנו זה הפרק ראוי לנו לרמוז ולעורר הספקות
> שיש בו, הספקות אשר יש בסתירת זאת התולדה, אלו הספקות הנופלות באלו ההקשים

followed by נאמר בהתרת הספק, התשובה באלו הספקות.

The lists are sometimes rather long. For instance, in chapter I.2.3 Isaac lists thirteen doubts followed by thirteen answers; in chapter IV.3.4 he lists and answers thirty-six doubts

169 Glasner, "Two Notes."

170 Wolfson, "Isaac Ibn Shem Ṭob," p. 288.

171 In her dissertation, Julia Schwartzmann took Wolfson's identification for granted. She noted differences between the manuscripts, but did not study them. See Julia Schwartzmann, "The Philosophy of Isaac Ibn Shem Ṭob: Physical and Theological Problems in Late Medieval Philosophy," Ph.D. dissertation, Hebrew University of Jerusalem, 1990.

172 Books I–IV as found in MS Munich are not identical to those in MS Cambridge No. 1. Sentences or parts of sentences are frequently missing. Many *derušim* and *toʿalot* are absent from MS Munich (e.g., I.3, II last chapter, IV.1). In I.1 the *toʿalot* are listed in both manuscripts, but the *derušim* are found only in MS Cambridge. Of the four passages in MS Cambridge that include references by Yiṣḥaq to his early commentary, only the first and last loci are found in MS Munich; in the first passage, there are two references in MS Cambridge and only one in MS Munich, and the text is rather different. Another example: At the end of I.1 (f. 5^b28), MS Munich has "and because of this remark we raised this doubt here," where MS Cambridge (f. 3^b7) reads, "and because of this remark we write this doubt here even though it is written in the first commentary." It seems to me more likely that MS Munich is an early draft than that it is a loose copy.

173 *ʾamar Yiṣḥaq* passages are distributed unevenly in the two parts of Yiṣḥaq's commentary. I found five in book IV, two in book VI, and thirteen in book VIII.

174 E.g., Yiṣḥaq begins II.1 with "our intention now is to comment on this chapter word by word because this issue (דרוש) is one of the significant issues in this science." The quotations that follow are from the Middle Commentary. In III.3.5 Yiṣḥaq quotes Ibn Rushd several times, introducing the quotations with "Ibn Rushd said." Similarly, in IV.3.4: "Since this chapter is difficult it is important to interpret it word by word."

175 E.g., I.1.3: הדרושים היוצאים מזה הפרק הם.

and then continues with several more unnumbered doubts.[176] From time to time, he uses Pattern 4 formulas: יש לאומר שיאמר, יש למספק שיספק. Each chapter concludes with a discussion of its subjects (הדרושים המגיעים מזה הפרק) and its lessons or utilities (התועלות המגיעות מזה הפרק). Isaac's *derušim* are different from Messer Leon's and close to Ṭodros Ṭodrosi's.[177] The *derušim* section is a summary of the main points made in the chapter; the *toʿalot* are the lessons of the chapter.[178] The scholastic term "consequence" (תולדה) is used frequently.[179]

It is important to note that this scholastic structure is imposed on the text, sometimes artificially or irrelevantly.[180] The author is apparently aware of this and gradually uses the scholastic patterns less systematically. The *derušim* and the *toʿalot,* found regularly in books I and II, are less frequent in books III and IV. In book IV there are five *ʾamar Yiṣḥaq* passages, a trace of the "old-fashioned" Pattern 3.[181] Books V–VIII of the late commentary (extant only in MS Munich) are even more defective than books I–IV of this manuscript.[182] It is easy to trace how the motivation to write a scholastic commentary deteriorated from book I to book VIII.

Consider now C1–C3 (erroneously attributed by Wolfson to Isaac Ibn Shem Ṭov), found in MS Cambridge, Trinity College 8.19: three anonymous commentaries on the *Physics,* copied in the same hand (supra, p. 199).

C1 is a collection of fragments: the prooemium and book I, following the Long Commentary (ff. 1–9b); book IV (ff. 10a–15b); a passage from VII.1 (f. 16a); a passage from *De anima* II (f. 16a–b, different hand); book II (18a–27b); and book III, chapters 2–4 (ff. 28a–31b). After book I both the Middle and Long Commentaries are quoted.[183] Quotations from the Long Commentary include both Aristotle's text and Ibn Rushd's comments. Patterns 1 and 4 are used. The formulas employed are ואם יאמר,[184] כבר ישאל שואל,[185] ויש לספק,[186] ואם יאמרו,[187] ועוד יקשה, יש להקשות,[188] and וא"ת.[189] There are two references to Gersonides[190] and one to "En Profet";[191] Steinschneider suggested that the latter means Profiat Duran.

176 He uses all question patterns: 4, 5, 6.

177 See supra, pp. 192–3.

178 In the same chapter: התועלות המגיעות ממנו הם ג"כ רבות.

179 This is a basic logical term that enjoyed a revival in the scholastic theory of *consequentiae* that flourished in the fourteenth century. See Ivan Boh, "Consequences," in Kretzman, Kenney, and Pinborg, *Cambridge History of Later Medieval Philosophy,* pp. 300–14.

180 In III.2.2 the *toʿelet* of the chapter is the knowledge of the *deruš* of this chapter; in III.2.3 the reader is referred to the *toʿelet* of the previous chapter.

181 MS Munich 45, ff. 169b, 178b, 180b, 259a. The fifth *ʾamar* passage appears only in MS Cambridge Mm. 6.25, f. 130b.

182 Books I–IV occupy 287 small folios, books V–VIII, only 99.

183 I illustrate here the joint use of the Middle and Long Commentaries. The author begins with the prooemium of the Long Commentary: MS Cambridge 8.19, ff. $1^{a}1$–$1^{b}8$, and $1^{b}8$–$2^{a}13$ are quotations of Ibn Rushd's Long Commentary (MS Paris BNF héb. 884, ff. $1^{a}4$–$1^{b}3$ and $2^{a}6$–$2^{b}23$, respectively). In the first chapter, he shifts to the Middle Commentary: MS Cambridge 8.19, f. $2^{a}13$ quotes Ibn Rushd's Middle Commentary (MS Hamburg 264, f. $2^{a}8$). He then returns to the Long Commentary (MS Cambridge 8.19 f. $2^{a}13$–15 quotes MS Paris 884 f. $3^{a}22$–3). He continues to quote the Middle and Long Commentaries in alternation: MS Cambridge f. $2^{a}17$–21 quotes from the Long Commentary (ff. $3^{a}27$–$^{b}2$, $2^{a}22$–3, and $2^{a}26$) and from the Middle Commentary (ff. $1^{b}12$–13 and 13–14).

184 MS Cambridge 8.19, ff. $3^{a}19$, $19^{b}13$.

185 F. $4^{a}7$.

186 F. $7^{a}23$.

187 F. $8^{a}8$–9.

188 Ff. $16^{a}11$, $9^{a}13$.

189 F. $13^{a}8$.

190 Ff. 11b, 22a.

191 F. 5a.

C2 is an incomplete commentary on the Middle Commentary, books I–IV.2.5.[192] The author was also familiar with the Long Commentary.[193] The patterns used are 1 and 4. The common formula is א"ת – נאמר or א"ת – והתשובה בזה,[194] יש לשאול.[195] There is a reference to Galen.[196]

C3 is an incomplete commentary on the Middle Commentary, books I–VII. There is a reference to the Long Commentary in book VII: "If you wish to understand this matter consult the 'on the word' commentary (שמע על המלה) on the *Physics* and you will find it explained there."[197] Patterns 1 and 4 are used. The formulas used are יש להקשות,[198] יש לשאול,[199] א"ת,[200] and י"ל.[201] The answers are usually introduced by התשובה לזה or נשיב. There is one Pattern 3 remark, introduced by אמר המפרש.[202] There are several references to Gersonides,[203] one to Narboni's commentary on al-Ghazālī's *Intentions of the Philosophers*,[204] and one to "the most recent among the philosophers."

Summary: The Spanish Circle. Now I want to substantiate my suggestion that the commentaries listed in this section were produced by a circle of scholars active in Spain after the middle of the fifteenth century.

Common Manuscript. All the Spanish commentaries follow the order of the Middle Commentary and reflect consultation of the Long Commentary. The Spanish commentators had at least one complete copy of the Long Commentary that included the rare books V–VIII. Among the extant Spanish commentaries, four include books V–VIII or parts of them: Isaac ben Shem Ṭov's (M/C), Shem Ṭov ben Joseph Ibn Shem Ṭov's (P4), and those by the anonymous authors of P1 and C3. It is rather unlikely that each of them had his own copy and more likely that they worked in cooperation. Another text that was available to them was Narboni's commentary on the *Natural Questions.* Both Shem Ṭov ben Joseph Ibn Shem Ṭov (in MS Paris 1004/4) and the author of P1 quote it.

Common Themes. As already mentioned, Wolfson pointed out similarities between Isaac's commentary (M/C) and commentaries C2 and C3, to the point that he was convinced that they were written by the same person. I mention here two additional examples. First, in

192 In the last chapter, IV.2.5, the copyist probably copied IV.2.5 of C3 by mistake. Ff. $62^{b}27$–63a30 is a copy of ff. $92^{a}3$–$93^{a}9$. The copied text breaks off before the end of the chapter.

193 E.g., several times the author uses the word *mitqomem,* which was introduced into Hebrew by the translator of the Long Commentary. The author ascribes to Plato the statement that matter is distance (MS Cambridge 8.19, f. $55^{b}8$). He could find this in the Long Commentary, Comment IV.15 (MS Paris BNF héb. 884, f. $141^{b}18$–20). In the Middle Commentary Ibn Rushd ascribes to Plato only the identification of matter with place.

194 A few examples: MS Cambridge 8.19, ff. $33^{a}5$, 8, 10, 12, 26; $34^{a}18$; $36^{a}22$; $37^{b}3$, 24; $40^{a}5$; $41^{b}20$; $42^{a}23$; $44^{b}7$; $48^{b}3$, 17; $49^{b}11$; $50^{b}12$; $53^{a}7$.

195 E.g., ff. $32^{a}18$, $40^{a}28$.

196 F. $35^{a}21$.

197 Ff. $115^{a}5$–6, see also Steinschneider, *Die hebräischen Übersetzungen,* p. 121.

198 E.g., ff. $68^{a}3$, 16, $^{b}22$, $69^{a}2$, $70^{a}1$, $^{b}21$, $72^{a}18$.

199 E.g., ff. $69^{a}9$, 20, $70^{a}22$, $70^{b}15$, 24, $71^{a}18$, $^{b}3$, $72^{a}4$, $73^{a}11$, $^{b}127$, $76^{b}3$, 10, 14, $^{b}6$, 20, $78^{a}3$, $79^{a}6$, 18, 31, $80^{a}17$, $81^{a}2$.

200 E.g., ff. $68^{b}1$, $70^{a}26$, $83^{a}13$.

201 Ff. $69^{a}26$, $^{b}11$, $70^{a}6$, 28, $^{b}6$, 18, $71^{a}13$, 23.

202 F. $116^{a}26$, probably through the end of the chapter ($116^{b}17$).

203 Ff. 92b, 94b, 95a, 108b. The quotation appears also in C2, but in the passage that was mistakenly copied from C3 (f. 63a).

204 F. 106a.

C3, M/C, P1, and P4,[205] on *Physics* V.1 and on *Physics* VI.4, we find the unusual expression הצורה האפרוחית (the "chick form"). The context is the metamorphosis of egg into chicken. I have not found this expression in the Middle or Long Commentaries by Ibn Rushd or in the early Hebrew commentaries.[206] Second, the definition of man as animate and rational (חי מדבר) is not mentioned by Ibn Rushd in chapter I.1.3 of the Middle Commentary or in the parallel section of the Long Commentary, but does appear in all of the Spanish commentaries on chapter I.1.3 – C1, C2, C3, P1, and P4[207] – on *Physics* I.1, in most cases in the unusual expression החיות והדבור. The Provençal commentary L/O,[208] which circulated among the Spanish commentators, may be their common source for this expression.[209]

Common Formulas and Abbreviations. The use of abbreviations is more common in the Spanish commentaries than in the others.

אח"ז	אחר זה
אל"כ	אם לא כן
א"ת	אם תאמר, אם תשאל, אם תקשה
ד"מ	דרך משל
ז"ל	זאת לומר
ז"ש	זה שאמר, זה שנאמר
י"כ	ירצה כאן, ירצה כי
י"ל	יש לשאול, יש להקשות, יש להשיב
כ"ל	כיון לאמר
כפ"ז	כפי זה
כ"ש	כל שכן
אל"ז	אמר לזה, אמר לזאת
מכ"ש	מה כל שכן
מ"ש	מה שאמר
ע"א	עוד אמר
ע"ד	על דרך
עז"ה	על זה הצד
ע"פ	על פי
ע"צ	על צד
ר"ל	רוצה לומר, רצונו לומר
שאל"כ	שאם לא כן
שכ"ש	שכל שכן
ת"ל	תרצה לשאול, תרצה לומר

Thus it seems to me that these commentaries were written in the same milieu by people who knew each other's work. We can follow a clear trend of scholasticization in this circle's compositions: an evolution from the simple Pattern 4 in C1–C3 and Isaac's first commentary to the scholastic Patterns 5 and 6 in P1, Shem Ṭov ben Joseph's commentary and short

[205] C3: V.2.3 (f. 103a), VI.7 (f. 112a). M/C: V.2.3 (MS Cambridge Mm. 6.25, f. 7a), VI.7 (f. 32a–36b), VIII.5.3 (f. 102a). P1: VI.7 (MS Paris BNF héb. 967/1, f. 66a–b), VIII.5.2 (f. 102a). P4: V.2.3 (f. 289a), VI.7 (f. 308a).

[206] The Byzantine and Italian commentaries do not include books V and VI.

[207] C1: MS Cambridge 8.19, f. $2^{b}30$. C2: MS Cambridge 8.19, f. $31^{a}13$. C3: MS Cambridge 8.19, f. $70^{a}7$–8. P1: MS Paris BNF héb. 967/1, f. $3^{b}3$, 4. P4: MS Paris BNF héb. 967/1, f. $208^{b}3$.

[208] MS London 1053, ff. $70^{a}9$, $67^{b}11$–12, 13, 19; MS Oxford 2050, ff. $44^{b}29$, 33, $45^{a}9$.

[209] Perhaps MS Oxford was copied for this group. It is in Spanish script and dated 1467. The script and page size are similar to those of the other Spanish commentaries.

treatises, and, most notably, in Isaac's second commentary.[210] Zonta has shown that the scholastic trend in Spain in the 1470s is also apparent in translations of scholastic works.[211]

CONCLUDING REMARKS

Referring to the extant commentaries on the *Physics*, I distinguished between early commentaries that were written in Provence in the first half of the fourteenth century and late commentaries that were written in Byzantium, Italy, and Spain in the second half of the fifteenth century. There might have been other smaller circles of scholars or individual commentators who were not affiliated with one of these groups; this could be an interesting but difficult subject for further research. In the case of the *Physics*, I suggested that "circles of commentators" are easy to identify, because in the fifteenth century, scholars grouped around copies of Ibn Rushd's Long Commentary, which was not easily accessible.

Because of errors in identification of several commentaries, it took time until the clear division into early and late commentaries was discerned. Steinschneider wrongly stated that several supercommentaries on the *Physics* were written in the thirteenth century. Consequently Gersonides' major role in establishing the supercommentary tradition was not recognized. Steinschneider's erroneous attribution of two highly scholastic late Spanish commentaries (M/C and P1) to Albalag, who lived in the thirteenth century, and to Narboni, who lived in the fourteenth, further obscured the historical picture. Still, the apparently neat division of the commentaries into early-simple and late-scholastic categories is somewhat misleading. The trend of "scholasticization" did not emerge in the fifteenth century, but was a slow progression throughout the period when supercommentaries were being written, from the early fourteenth to the late fifteenth century, with a notable crescendo in the later part of this period.

This classification offered here is based on stylistic analysis. The criteria employed are the use of formal structures, notably of the question Patterns 5 and 6, which are considered to be typically scholastic. The adjective "scholastic" is used to describe the complex style of writing and is not meant to suggest a Christian origin. The fourteenth-century commentaries on the *Physics* are structurally simple, with the relatively minor but significant exception of a few uses of Patterns 5 and 6 by Ṭodrosi. The fifteenth-century commentaries are much more scholastic, but to different degrees. Those that were written in Italy and Spain are more scholastic than those written in Byzantium, but even in the late period in Spain, we see that the adoption of scholastic style was still in progress. Most notable is the example of Isaac ben Shem Ṭov's two commentaries on the *Physics*, the relatively simple one and the exceedingly scholastic one. Let us now look at the early period and try to locate the first instances of this process.

The first evidence of Patterns 5 and 6 found in this study (based on the commentaries on the *Physics*) was in Ṭodrosi's work of the 1330s.[212] These instances of the scholastic patterns

[210] Pattern 3 is rare and is found only in Yiṣḥaq ben Shem Ṭov. There are three *ʾamar Mošeh* passages in P1, but they are quotations from Moses Narboni rather than statements by the author. See supra, p. 197.

[211] From this period we have three translations of treatises on the *Physics.* There is a translation of Robert Grosseteste's *Summa in octo libros Physicorum* (כלל העולה מכל שמונה ספרי השמע הטבעי), which Zonta dates between 1460 and 1470 (*Hebrew Scholasticism,* p. 20 n. 87). Eli ben Joseph Ḥavilio of Aragon translated the *Quaestiones on the Physics* by Johannes Versoris (ורשוריו מפאריש) in the 1470s (ibid., pp. 171–2; Steinschneider, *Die hebräischen Übersetzungen,* p. 487, Section 298). Somewhat later, shortly after the expulsion from Spain, David ben Samuel Ibn Shoshan translated Thomas Bricot's *Compendium of Aristotle's Physics.*

[212] Manekin remarks that as far as he can judge, the logical work of Ṭodros Ṭodrosi is "bereft of scholastic doctrines." See Manekin, "Scholastic Logic and the Jews," p. 125.

are scant and could easily have been overlooked, but evidence from other literary genres can be adduced to show that they are not mere coincidences.

Between 1321 and 1324, Gersonides wrote his supercommentaries on logic and natural science. Stylistically these commentaries are simple throughout.[213] The contents are also almost exclusively in the Arabic tradition. Of the logical commentaries, Charles Manekin unequivocally states that "there is no trace of [Christian] scholastic influence, or awareness of [Christian] scholastic doctrines or writings" in them.[214] There may be a few allusions to Christian-scholastic ideas in the commentaries on natural science, but this finding is not unequivocal,[215] and they certainly are not dominant. The first unmistakable use of the scholastic Patterns 5 and 6 that cannot be ignored comes around 1329 in Gersonides' *Wars of the Lord* and in his commentary on *Genesis*.

In his *Wars of the Lord* (completed in 1329), Gersonides presents several lists of "doubts" or "questions" using Patterns 5 and 6. In V.II.7 he lists twenty-seven questions *(derušim)* that he answers in the two following chapters. In VI.I.18, for instance, he lists nine doubts followed by nine resolutions. There are several additional shorter lists of doubts.[216] The use of scholastic patterns in the *Wars* can be explained in terms of the evolution of Gersonides' method. In VI.I.18 he claims, "We ought now to examine several doubts that follow from this [doctrine of] creation that has [just] been proved, because *through this [investigation] we shall attain complete knowledge, so that no doubt or objection will remain.*"[217] Sara Klein-Braslavy has pointed out Gersonides' heavy use of the dialectic method to test hypotheses;[218] this approach could have encouraged the use of lists of doubts. At about the same time, starting with the commentary on *Genesis*, Gersonides used a tight formal structure that includes Pattern 6–type numbered lists of doubts as well as "lessons" (*toʿalot*) at the ends of the chapters. We find a similar stylistic element a century and a half later in Isaac ben Shem Ṭov's highly scholastic second commentary on the *Physics*.[219] Thus we find two different starting points for the scholastic style in Gersonides: the *Wars* and the biblical commentaries.

Marc Saperstein, who has studied the development of "the method of doubts" in Hebrew biblical commentaries and homilies, found questions, doubts, and queries introduced by

[213] Of the seven commentaries on the *Organon*, the first three are not dated; the last four are dated between February and August 1323. Scholars usually take for granted that the first three were written in 1322–3.

[214] Manekin, "Scholastic Logic and the Jews," pp. 124–5. However, Manekin comments that in Provence at about the same time, Ḥezekiah bar Ḥalafta cites a wide range of Christian authors. See "When the Jews Learned Logic from the Pope: Three Medieval Hebrew Translations of the Tractatus of Peter of Spain," *Science in Context* 10 (1997): 395–430, on p. 397. If this gloss-commentary was indeed written in Provence, it deserves special study.

[215] When she was preparing *Les méthodes de travail de Gersonide,* Colette Sirat asked me to collect examples of such instances in the commentaries on natural science. I collected a few "suspect passages" of which I selected the two, which I presented in there (pp. 281–7). With regard to the first of these, Prof. Seymour Feldman corrected me and pointed out possible sources in the Arabic tradition. I am very grateful to him for this comment.

[216] *Wars of the Lord* I.7, I.13, II.2 (ed. Leipzig, p. 94.14), II.6, IV.6 (p. 176.19), VI.II.8. (p. 434.30), VI.II.14.

[217] *Wars of the Lord* VI.1.18 (ed. Leipzig, p. 368); English (with minor modifications) from Levi ben Gershom, *The Wars of the Lord,* trans. Seymour Feldman (Philadelphia: Jewish Publication Society, 1984–99), 3: 332. Shem Ṭov Ibn Shem Ṭov, a century and a half later, makes a similar comment: "It is appropriate to express doubts about it (ראוי לספק בו), for whoever does not express doubts does not know." Quoted in Saperstein, "The Method of Doubts," p. 136.

[218] See Sara Klein-Braslavy, "The Opinions That Give Rise to the Aporias in Gersonides' *Wars of the Lord,*" in E. Fleischer, G. Blidstein, C. Horowitz, and B. Septimus eds., *Meʾah Sheʿarim: Studies in Medieval Jewish Spiritual Life in Memory of Isadore Twersky* (Jerusalem, 2001) (in Hebrew), pp. 317–40; revised and expanded version in English in idem, *Without any Doubt: Studies in Gersonides' Methods of Inquiry* (forthcoming); idem, "The Solutions of the Aporias in Gersonides' *Wars of the Lord,*" *Daʿat* 50–2 (2003): 499–514 (in Hebrew); revised and expanded version in English in idem, *Without any Doubt;* idem, "La méthode diaporématique de Gersonide dans les *Guerres du Seigneur,*" in Sirat, Klein-Braslavy, and Weijers, *Les méthodes de travail de Gersonide*, pp. 105–34.

[219] See supra, p. 200.

the same formulas as in the philosophical commentaries (e.g., "in this section there are *N* doubts"; "after the mention of these doubts we will proceed to their explanation").[220] The method of doubts, typical of the generation of the expulsion from Spain, actually goes back to the first half of the fourteenth century and Gersonides. Significantly, Saperstein found no "clear example of this technique in any thirteenth-century commentary or any of the very few extant collections of sermons."[221] Lists of questions were used in Judeo-Arabic biblical commentaries composed in the East,[222] but so far no link has been established between these and the Hebrew commentaries composed in the West. The Arabic commentaries were not translated into Hebrew, and it is doubtful that Gersonides or other commentators in Provence were acquainted with them.[223] In the fourteenth and fifteenth centuries, thus, the two traditions of the philosophical and of the biblical commentaries developed along parallel lines.

A comparative study of the exact meanings of שאלות, ספקות, דרושים, and תועלות in Hebrew philosophical and biblical commentaries and of the parallel terms in Latin philosophical and biblical commentaries may shed additional light on this subject.[224]

[220] Marc Saperstein, "The Method of Doubts: Problematizing the Bible in Late Medieval Jewish Exegesis," in Jane Dammen McAuliffe, Barry D. Walfish, and Joseph W. Goering, eds., *With Reverence to the Word: Medieval Scriptural Exegesis in Judaism, Christianity and Islam* (Oxford: Oxford University Press, 2003), pp. 133–56, on pp. 135–6.

[221] Ibid., p. 139.

[222] See David Sklare, "Questions in the Bible," in Meir Bar-Asher et al., eds., *A Word Fitly Spoken: Studies in Medieval Exegesis of the Hebrew Bible and the Quran* (Jerusalem: Ben-Zvi Institute, 2007) (in Hebrew), pp. 205–31.

[223] See Colette Sirat, "Biblical Commentaries and Christian Influence: The Case of Gersonides," in Nicholas de Lange, ed., *Hebrew Scholarship and the Medieval World* (Cambridge: Cambridge University Press, 2001), pp. 210–23, on p. 215.

[224] On the latter see Gad Freudenthal "Gersonide génie solitaire" in Sirat et al. *Les méthodes de travail de Gersonide et le maniement du savoir chez les scolastiques* (Paris: J. Vrin, 2003), 291–317, on pp. 299–304.

11

Latin Scholastic Influences on Late Medieval Hebrew Physics

The State of the Art

Mauro Zonta

The first decades of the fourteenth century saw incipient changes in Jewish philosophy and science in southwestern Europe. Until then, Arab-Islamic philosophy and science had been its major and almost only source. After 1320, Jewish scholars, especially in Provence, expounded new doctrines and new interpretations of old questions, some of which were not found in Arabic philosophy and science. A number of these new doctrines concerned Aristotelian physics, as found in the *Physics* and in the *De caelo*.

According to Shlomo Pines, who published a long essay on this question more than forty years ago, the change was probably due to the "influence" of Scholasticism on fourteenth-century Jewish physics.[1] In his opinion, traces of contemporary discussions of Scholastic physics (and metaphysics)[2] can be found in the works of fourteenth-century Jewish scholars such as Gersonides (1288–1344), Jedaiah Bedershi ha-Penini (1285–ca. 1350), and Ḥasdai Crescas (ca. 1340–1411). Pines tried to show, for example, that the interpretation of the concept of "now" (concerning the possibility of eternity) in Gersonides' *Wars of the Lord* is very close to that in the *Questions on the Physics* by Pseudo-Siger of Brabant,[3] or that Jedaiah ha-Penini's theory of the "discrete and continuous" is very close to that of fourteenth-century Latin Nominalism, especially in William of Ockham (1285–ca. 1350),[4] whereas his doctrine of the influence of the heavenly sphere on heavy and light bodies through a "force" is similar to an idea of Scotism.[5] As a matter of fact, Pines is rather cautious in affirming

[1] See Shlomo Pines, "Scholasticism after Thomas Aquinas and the Teachings of Hasdai Crescas and His Predecessors," *Proceedings of the Israel Academy of Science and Humanities* 1 (1967): 1–101 (in Hebrew); quoted here in the English version, trans. Alfred L. Ivry, in Shlomo Pines, *Studies in the History of Jewish Thought*, ed. Warren Zeev Harvey and Moshe Idel (Jerusalem: Magnes Press, 1997), pp. 489–589. Note that even before the first publication of this essay, Pines had pointed out the possible existence of traces of Scholastic "influences" on some fourteenth-century Provençal Jewish scholars, such as Joseph Ibn Caspi. See Shlomo Pines, "Joseph Ibn Caspi's and Spinoza's Opinion on the Probability of a Restoration of a Jewish State," *Iyyun* 14 (1964): 289–317 (in Hebrew); repr. in Shlomo Pines, *Studies in the History of Jewish Philosophy: The Transmission of Texts and Ideas* (Jerusalem: Magnes Press, 1977), pp. 277–305 (in Hebrew), esp. p. 283 (on the *contingentia futura* according to Caspi and some fourteenth-century Scholastic philosophers and theologians).

[2] On the influence of Scholastic metaphysics on some fourteenth- and fifteenth-century Jewish philosophers, see also Mauro Zonta, "Metaphysics in Medieval Hebrew Tradition: A Short Historical Sketch," *Quaestio* 5 (2005): 243–58.

[3] See Pines, "Scholasticism," pp. 497–500.

[4] Ibid., pp. 547–8.

[5] Ibid., pp. 552–3.

I am very grateful to Gad Freudenthal for his helpful comments about some points of this article.

Gersonides' and Jedaiah's relationship to Christian doctrines and admits that more evidence is needed. The case of Ḥasdai Crescas might be different, because he was able to point to many more parallels to Crescas's critique of Aristotle's physics and his new physical doctrines (about matter and about time) in Ockham, in proponents of Scotism such as Gerald Odonis (1290–1349), and in Nicholas Oresme (1323–ca. 1382), Nicholas Bonet (1280–1343), and several other fourteenth-century Christian Schoolmen. In this case, too, however, he remains cautious: "Even if we accept the idea – which is close to being certain – that Crescas is to be placed within the Scholastic framework, one must remember that he maintained a marked independence, and in discussing physical problems related explicitly . . . to another tradition – the Arabic-Jewish philosophical one."[6]

Since Pines's pioneering essay, a number of works have focused on particular points of their doctrines to highlight the possibility of a relationship between fourteenth- and fifteenth-century Jewish scholars and Scholastic physics.[7] In fact, the putative influence of Scholasticism on late medieval Jewish physics should be discussed separately for the three regions: Provence, Spain, and Italy.

PROVENCE

Several studies of possible traces of Scholastic physics in the works of fourteenth-century Provençal Jewish philosophers and scientists appeared in the late twentieth century. For Jedaiah ha-Penini, Ruth Glasner pointed out his unusual conception of the void, which contradicts the Aristotelian doctrine. He could not have found it in the Arabic-Hebrew tradition, but perhaps in *Questions on the Physics* by Pseudo-Scotus[8] and *Quaestiones Quodlibetales* by Duns Scotus (1265–1308), which propound a conception of the void in very similar terms.[9] We must also remember that, according to Pines, Jedaiah's metaphysical notion of the individual forms is too similar to Scotus's doctrine to be the result of chance.[10] As for Gersonides, Steven Harvey has tried to show the resemblance between his doctrine of the "absolute generation of first matter" and the idea of the "creation of first matter" found in the commentary on the *Physics* by Thomas Aquinas (1225–74).[11] Glasner pointed out the similarity between Gersonides' theory of natural motion and that taught by William of Ockham, both of which are at variance with the traditional Aristotelian doctrine of the natural places of elements. However, because there are also consistent differences between the two, Glasner admits that the relationship requires further study.[12]

6 See ibid., pp. 502–11 and 537–9, esp. p. 510 (from which the quotation is taken).

7 For a general *status quaestionis* about the relationship between fourteenth-century Jewish philosophy and Latin Scholasticism, see Tamar M. Rudavsky, "The Impact of Scholasticism upon Jewish philosophy in the Fourteenth and Fifteenth Centuries," in Daniel H. Frank and Oliver Leaman, eds., *The Cambridge Companion to Medieval Jewish Philosophy* (Cambridge: Cambridge University Press, 2003), pp. 345–70, esp. pp. 357–62 (Scholastic influences on Ḥasdai Crescas's physics).

8 Note that the *Quaestiones in octo libros Physicorum* that Glasner ascribes to Duns Scotus in this article, based on what is found in a seventeenth-century edition of Scotus's works, are surely *not* by Scotus; they might be by Marsilius of Inghen (1330–96): cf. Pines, "Scholasticism," p. 495 n. 7.

9 See Ruth Glasner, "Yeda'aya ha-Penini's Unusual Conception of Void," *Science in Context* 10 (1997): 453–70, esp. pp. 466–8.

10 See Shlomo Pines, "Individual Forms in the Teaching of Yeda'ayah Bedershi," in *Harry Austryn Wolfson Jubilee Volume* (Jerusalem: American Academy for Jewish Research, 1965), Hebrew section, pp. 187–201 (in Hebrew); repr. in Pines, *Studies in Jewish Philosophy,* pp. 263–76, esp. pp. 270–4.

11 See Steven Harvey, "Did Gersonides Believe in the Absolute Generation of First Matter?" *Jerusalem Studies in Jewish Thought* 7 (1988): 307–18 (in Hebrew), esp. pp. 317–18.

12 See Ruth Glasner, "Gersonides' Theory of Natural Motion," *Early Science and Medicine* 1 (1996): 151–203, esp. pp. 201–3.

In recent years, however, the question of the possible knowledge and use of Scholastic physics by fourteenth-century Provençal Jewish philosophers has been reviewed in the light of new research, yielding more cautious and sometimes skeptical conclusions. In a recent volume on Jedaiah ha-Penini,[13] Ruth Glasner demonstrated that some of the similarities alleged by Pines between Scholastic physics on the one hand and Gersonides' and Jedaiah's physical theories on the other can be explained as independent derivations from the same Greek and Arabic sources, that is, from Aristotle and Averroes.[14] Glasner has also highlighted the existence of analogies between some points of Jedaiah's physics and certain elements of the theories of John Buridan (1295–1358), William of Ockham, and Duns Scotus.[15] She concludes, however, that although Jedaiah (and, according to her, Gersonides too) "apparently . . . knew *to a certain extent* [italics added] the subjects studied by contemporary Christian scholars,"[16] there is no proof that Jedaiah had direct knowledge of contemporary Christian culture. He probably did not know Latin and could have known something of Scholastic physics only through face-to-face contact with Christian scholars (there is some slight evidence in his work of such contact).[17] As for Gersonides, Glasner has recently affirmed that "he had a certain knowledge of some questions that were discussed by Christian scholars and of some answers that were given or arguments that were offered"; she cites two questions (discussed by Walter Burley [1275–1346], John of Jandun [1285–1328], and Pseudo-Duns Scotus in their commentaries on the *Physics*) that Gersonides, too, discusses in his *Wars of the Lord* and supercommentary on Averroes' *Middle Commentary on the Categories*.[18] The existence of a general Scholastic influence on Gersonides has been upheld by Colette Sirat,[19] but Gad Freudenthal has raised serious doubts with respect to the validity of her arguments and about Gersonides' real and direct knowledge of Latin Scholasticism (including the fourteenth-century "new physics" of Ockham and Buridan).[20]

Discussing Gersonides' relationship to Scholasticism, Freudenthal argues that, although the possibility that Gersonides might have had an occasional, oral knowledge of some Scholastic doctrines cannot be ruled out, there is no sign that Scholastic doctrines had any substantial impact on his work. His only contacts with Christian scholars, so far as we know, occurred later in Gersonides' life, when his scholarly formation was complete (around 1320) and he had already developed his own physical theories. Freudenthal, following José Luís Mancha,[21]

[13] Ruth Glasner, *A Fourteenth Century Scientific Philosophic Controversy: Jedaiah Ha-Penini's Treatise on Opposite Motions and Book of Confutation* (Jerusalem: World Union of Jewish Studies, 1998) (in Hebrew). See also Ruth Glasner, *Averroes' Physics: A Turning Point in Medieval Natural Philosophy* (Oxford: Oxford University Press, 2009).

[14] Ibid., p. 92 n. 15 (Jedaiah) and p. 136 n. 73 (Gersonides).

[15] See in particular ibid., pp. 38, 54–6, 61, 71.

[16] Ibid., p. 64.

[17] See ibid., pp. 25–6.

[18] See Ruth Glasner, "On the Question of Gersonides' Acquaintance with Scholastic Philosophy," in Colette Sirat, Sara Klein-Braslavy, and Olga Weijers, eds., *Les Méthodes de travail de Gersonide et le maniement du savoir chez les Scolastiques* (Paris: Vrin, 2003), pp. 281–7, esp. p. 281 (where the quotation is found). I understand from Glasner that after the paper was published, Prof. Seymour Feldman pointed out to her a possible Arabic source for the first of the two examples she had given; it is, therefore, uncertain (personal communication, June 1, 2009).

[19] See in particular Colette Sirat, "Le problème posé par les rapports entre Gersonide et le milieu ambiant," in Sirat, Klein-Braslavy, and Weijers, *Méthodes de travail de Gersonide*, pp. 9–18; Colette Sirat and Sara Klein-Braslavy, "Réponses aux objections: Gersonide, homme de son temps," ibid., pp. 317–24.

[20] See Gad Freudenthal, "Gersonide, génie solitaire. Remarques sur l'évolution de sa pensée et de ses méthodes sur quelques points," ibid., pp. 291–317. Some of the arguments employed by Freudenthal are also found in Charles Touati, *La Pensée philosophique et théologique de Gersonide* (Paris: Les Éditions de Minuit, 1973), p. 148 n. 93.

[21] See the reference to Mancha's observations in Freudenthal, "Gersonide," p. 312.

also points out that Gersonides evinces a marked ignorance of Latin science where one would most expect him to know it – in astronomy.

To be sure, it is possible to explain the aforementioned innovations in physics found in Jedaiah ha-Penini and in Gersonides as the result of an independent advance of Jewish science. According to this argument, the development of Hebrew science in Provence resembles that in Arab-Islamic science at the beginning of the tenth century, at the end of the golden period of translations of Greek philosophical and scientific texts. It was then that Arabic scholars began to display a growing independence from Greek science and its ancient interpreters. Dimitri Gutas has pointed out that, around 900 CE, Arabic philosophers and scientists began to develop a philosophy and science of their own, which were not a mere continuation of classical Greek thought, and even to criticize old and long-accepted doctrines (one can think of Abū Bakr al-Rāzī's [865–925] criticism of Galen, or of Ibn al-Haytham's [965–1040] criticism of Ptolemy).[22] This philosophical and scientific revival was not the result of any external influence on Arab-Islamic thought. Something similar could have happened in European Jewish science after 1300: The golden period of translations from Arabic was nearing its end (the translation of seminal Arabic philosophical and scientific texts into Hebrew ceased around 1340); it is possible that Jewish philosophical and scientific thought became more mature and more independent of its sources and developed new problems and new solutions that had not been raised before.

Nevertheless, there is a basic difference between Arabophone scholars in tenth-century Iraq and Jewish scholars in fourteenth-century Provence. The former worked in a milieu that was overwhelmingly Islamic; their relations with other cultures, as far as the sciences are concerned, appear to have been rather circumscribed. In contrast, the Provençal Jewish scholars worked in a Christian environment in which, just then, in the first decades of the fourteenth century, important developments involving a critique of Aristotelian physics (the aforementioned "new physics") were taking place in the natural sciences. Is it not possible that these developments in Scholastic science influenced contemporary Jewish scholars? Were the new doctrines and new problems of Aristotelian physics as formulated by fourteenth-century European Jewish scholars exclusively the result of the internal development of their own thought, or were they at least stimulated by the contemporary discussions by Christian Schoolmen in the same field and around the same questions?

The question is not easy to answer. For one thing, fourteenth-century Provençal Jewish physicists (Gersonides, Jedaiah ha-Penini, the members of Gersonides' "school" recently studied by Glasner)[23] did not as a rule refer explicitly to their knowledge or direct use of Latin Scholastic sources. More important, they do not evince any familiarity with some of the most important questions discussed in contemporary Scholastic science; even when they attend to the same questions as their Latin counterparts, they employ different methods to discuss them. For example, they are unaware of one of the most important Scholastic methods for investigating philosophical and scientific problems, the *quaestio disputata* (apart from some traces that may perhaps be found in Gersonides' *Wars of the Lord*[24]).

[22] See Dimitri Gutas, *Greek Thought, Arabic Culture* (London: Routledge, 1998).

[23] See Ruth Glasner, "Levi ben Gershom and the Study of Ibn Rushd in the Fourteenth Century," *Jewish Quarterly Review* 86 (1995): 51–90.

[24] See recent studies by Sara Klein-Braslavy, esp. "La méthode diaporématique de Gersonide dans *Les Guerres du Seigneur*," in Sirat, Klein-Braslavy, and Weijers, *Méthodes de travail de Gersonide*, pp. 105–34. However, the method of the *quaestio disputata* seems to appear in late medieval Jewish science in the middle of the fourteenth century, e.g., through the Hebrew translation of the *Lilium Medicinae* of Bernard of Gordon (1348); see Mònica Olalla, "Estructuras argumentativas en el discurso cientìfico: la escolàstica y la medicina hebrea del s. XIV," *Miscelànea de estudios àrabes y hebraicos. Secciòn de hebreo* 54 (2005): 77–96.

What conclusion can be drawn from this survey of recent research? It seems to me that although in some cases there may be indications that Jewish scholars had a direct but very circumscribed knowledge of Scholastic physics, as a rule the influence of Scholastic physics on Jewish science in fourteenth-century Provence, if any, seems to have been mostly personal (i.e., through oral conversations rather than by reading Latin texts), circumscribed (i.e., related to only isolated points), and implicit (i.e., it was not openly acknowledged in Hebrew scientific texts). Therefore, we cannot expect that we will ever have incontrovertible proof of a massive and direct Scholastic influence on Hebrew science in fourteenth-century Provence.

SPAIN

Ḥasdai Crescas worked in a different place (Catalonia) and different age. Modern scholars are skeptical about his direct awareness of fourteenth-century Scholastic physics. Warren Zeev Harvey has argued that Crescas's master, Nissim of Gerona (1310–ca. 1375), could have read and used William of Ockham's theory of the creation of a unique first matter, common to heaven and earth, and may also have known something of John Buridan's doctrine of creation.[25] He has found an apparent literal correspondence between passages in Nissim's *Homily on Creation* and *Commentary on Genesis*[26] and the relevant arguments in Ockham's *Summula philosophiae naturalis*. According to Harvey, "there is no reason to doubt that [Nissim's] Latin was sufficient for reading philosophic texts," so that the latter could have read Ockham or a Latin philosophical work that contained a passage quoted from Ockham. The same could apply to Crescas. Harvey holds that "Crescas was part of the same bold and innovative scientific movement as Nicole Bonet, Thomas Bradwardine and Nicole Oresme"[27] and has shown that some of Crescas's ideas, as presented in his *Light of the Lord*, are very close to doctrines of Nicholas Oresme's physics in the latter's *Livre du ciel et du monde* and *Questions on the De caelo*; in particular, there is an apparent similarity between their doctrines of the multiplicity of worlds, a point already alluded to by Pierre Duhem and Shlomo Pines.[28] Harvey has not demonstrated a direct relationship between Crescas and Oresme, although he seems to be convinced that the latter exerted "influence" on the former. He concedes, however, that this doctrine is found in different contexts in the two authors (physical for Crescas, theological and metaphysical for Oresme). Thus, although there are "interesting similarities between Oresme and Crescas, . . . the differences are of more interest."[29]

With regard to fourteenth-century Spain, scholars have not been able to go beyond formulating hypotheses of a possible "influence" of Scholasticism on Jewish philosophy, including physics. The case is totally different in the fifteenth century, when such an influence can definitely be established. In Spain in this period, one may indeed speak of the rise of a Hebrew Scholasticism, namely the production of Hebrew philosophical texts evincing a direct and explicit use of Latin Scholastic doctrines and techniques. Hebrew Scholasticism, which included physics, consisted of the composition of philosophical and scientific works in Hebrew that strictly followed the schemes of contemporary Latin works: commentaries

[25] See Warren Zeev Harvey, "Nissim of Gerona and William of Ockham on Prime Matter," *Jewish History* 6 (1992): 87–98.

[26] See also the recent annotated critical edition of Nissim's *Commentary on Genesis*, in Howard Kreisel, ed., *Rabbi Nissim Massilitani Liber Ma'ase Nissim. Commentarius in Pentateuchum* (Jerusalem: Mekiṣey Nirdamim, 2000), esp. pp. 74–8 (in Hebrew).

[27] Warren Zeev Harvey, *Physics and Metaphysics in Hasdai Crescas* (Amsterdam: J. C. Gieben, 1998), p. 3.

[28] See Harvey, *Physics and Metaphysics*, pp. 23–9; cf. Pines, "Scholasticism," pp. 504–7; Pierre Duhem, *Le système du monde* (Paris: Hermann, 1913–54), Vol. 5, pp. 230–2 and Vol. 7, pp. 297–301.

[29] Harvey, *Physics and Metaphysics*, p. 29.

on Aristotle, Scholastic *quaestiones*, and so on. The sources used by the Jewish authors of these writings were Latin, usually the same ones as employed by contemporary Scholastic philosophers who were their neighbors. These works feature many explicit and partial translations of Latin texts; their only difference with respect to contemporary Scholastic writings by Christian scholars is the use of a different language. This historical phenomenon has been identified only recently and is only now starting to be studied.[30]

The limited scholarly research about fifteenth-century Hebrew Scholasticism in Spain has not yet revealed the existence of a special interest in physics among Spanish Jewish philosophers. This apparent uninterest is probably not due to the lack of sources or the absence of contacts with Christian Schoolmen and Christian culture: There is evidence that such contacts were very intensive in the fifteenth century (both in Spain and in Italy); some Jewish philosophers may even have attended university courses.[31] The absence of physics from the agenda of Hebrew Scholasticism seems rather to reflect the Jewish philosophers' limited interest in physics. Thus, most of the writings of late fifteenth-century Spanish Hebrew Scholastics such as Eli Ḥabillo (fl. 1465–ca. 1480), Abraham Bibago (1420–ca. 1489), Abraham Shalom (d. 1492), and Baruch Ibn Yaʿish (fl. 1480–90) deal with other matters: metaphysics, ethics, and psychology. Still, modern scholars have identified traces of knowledge of Scholastic physics there, which can be points of departure for deeper insights. Abraham Nuriel found references to one of William of Ockham's commentaries on the *Physics* (taken from his *Summula philosophiae naturalis*) in Bibago's metaphysical treatise *On the Plurality of Forms*, written between 1450 and 1489: This may well be one of the earliest *explicit* uses of Ockham's physics by a Jewish writer.[32] A detailed analysis of Bibago's text shows, furthermore, that its discussion of some physics-related questions (e.g., what is the subject of physics and the role played by form and matter in generation) draws on various Scholastic sources, some named explicitly (e.g., Aquinas's commentary on the *Physics*), others quoted without attribution.[33] Bibago's most important implicit sources include two works on physics by late medieval Scotists: the *Questions on the Physics* by John the Canon (fourteenth century) and *De tribus principiis rerum naturalium* by Antonius Andreas (1280–ca. 1320).[34] Moreover, other detailed discussions of physical problems, preserved in a Paris manuscript but not yet studied, should probably be ascribed to Bibago.[35]

References to Scholastic texts on physics and discussions of physical questions are found also in philosophical correspondence between Eli Ḥabillo, Shem Ṭov Ibn Shem Ṭov (second

[30] For a general sketch of Hebrew Scholasticism and recent research on it, see Mauro Zonta, "The Relationship of European Jewish Philosophy to Islamic and Christian Philosophies in the Late Middle Ages," *Jewish Studies Quarterly* 7 (2000): 127–40, esp. pp. 135–40. For an overview of more recent studies, see idem, "Einige Bemerkungen über 'hebräische Scholastik' im 15. Jahrhundert in Spanien und Italien," *Im Gespräch* 7 (2003): 52–60; idem, "The Autumn of Medieval Jewish Philosophy: Latin Scholasticism in Late-Fifteenth-Century Hebrew Philosophical Literature," in Jan J. Aertsen and Martin Pickavé, eds., *'Herbst des Mittelalters'? Fragen zur Bewertung des 14. und 15. Jahrhunderts* (Berlin: de Gruyter, 2004), pp. 474–92. A first history and sourcebook on fifteenth-century Hebrew Scholasticism in Spain and Italy has recently appeared: Mauro Zonta, *Hebrew Scholasticism in the Fifteenth Century* (Dordrecht: Springer, 2006).

[31] See Rudavsky, "The Impact of Scholasticism," p. 350.

[32] See Abraham Nuriel, "The Philosophical Doctrine of Abraham ben Shem Tov Bibago," Ph.D. dissertation, Hebrew University of Jerusalem, 1975, pp. 24–6 (in Hebrew); idem, *Concealed and Revealed in Medieval Jewish Philosophy* (Jerusalem: Magnes Press, 2000), p. 296 (in Hebrew).

[33] This analysis is found in Zonta, *Hebrew Scholasticism*, pp. 45–107. For a list of the Scholastic sources quoted by Bibago, see esp. ibid., pp. 44–5.

[34] On the existence of a sort of "Hebrew Scotism" in fifteenth-century Spain, see Mauro Zonta, "Elementi per la storia di uno 'Scotismo ebraico,'" *Quaestio* 8 (2008): 201–18.

[35] MS Paris, BNF Héb. 1004, ff. 48r–51v. See Zonta, *Hebrew Scholasticism*, p. 38.

half of the fifteenth century), Abraham Shalom, and other late fifteenth-century Spanish Jewish scholars; these texts, probably written circa 1470–80, have been studied by Jean-Pierre Rothschild[36] and by me.[37] However, each of them had a different approach to Scholastic physics. In his "physical question" to Shem Ṭov Ibn Shem Ṭov concerning the existence of an infinite force in the heavenly body, Ḥabillo seems to draw mainly on traditional Arab-Islamic sources (Averroes and al-Ghazālī).[38] In contrast, when discussing two questions (one of them in physics: "if the generation of something from another thing is a natural fact"), Ḥabillo, as well as Abraham Shalom, mentions several Scholastic sources, including Walter Burley's *Commentary on the Physics* and Marsilius of Inghen's *Quaestiones de generatione et corruptione.* Note Ḥabillo's statement that Marsilius and "his friends" Albert of Saxony (1316–90) and John Buridan "did not know anything of Aristotle," a remark that may express a harsh critique of the "new physics."[39]

It seems, however, that fifteenth-century Jewish philosophers in Spain were more interested in translating texts of Scholastic physics than in employing them as sources. Their translations[40] encompassed texts from the entire Scholastic tradition of commentaries on Aristotle's *Physics* from the thirteenth to fifteenth century, with no regard for different milieus and philosophical schools. There is a Hebrew translation of a *Summa in octo libros Physicorum*, falsely ascribed to Robert Grosseteste (1168–1253), which was probably translated in Spain after 1450.[41] In 1472–3, Ḥabillo translated the questions on the *Physics* and on the *De caelo* by his contemporary Jean Letourneur (Johannes Versor, d. after 1482), a Thomist who was a professor in Paris.[42] Ḥabillo himself indicates that he wanted to translate John the Canon's *Questions on the Physics* and Antonius Andreas's *De tribus principiis.*[43] Finally, Abraham Shalom produced a Hebrew translation of the *Philosophia pauperum* by Albertus of Orlamünde (thirteenth century), which includes a short treatment of Aristotelian physics.[44] As far as we know, the only fifteenth-century Spanish Hebrew commentary on the *Physics* that probably drew on Scholastic sources is that by Baruch Ibn Yaʿish, of which only a long introductory fragment is extant.[45]

36 See Jean-Pierre Rothschild, "Questions de philosophie soumises par ʿĒlī Ḥabiliō à Šēm Ṭōb Ibn Šēm Ṭōb, v. 1472," *Archives d'histoire doctrinale et littéraire du Moyen Age* 61 (1994): 105–32.

37 See Zonta, *Hebrew Scholasticism*, pp. 166, 169, and 201–8.

38 MS Parma, Biblioteca Palatina, parmense 2631, ff. 7r–13v; for a French summary, see Rothschild, "Questions," pp. 121–3.

39 On the discussion of these two questions by Ḥabillo and Shalom, see the English summary in Zonta, *Hebrew Scholasticism*, pp. 201–8, esp. p. 207.

40 On these translations in general, see Moritz Steinschneider, *Die Hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin: Kommissionsverlag des Bibliographischen Bureaus, 1893; repr. Graz: Akademische Druck- und Verlagsanstalt, 1956), pp. 466, 468–70, 483–9. Cf. also Mauro Zonta, *La filosofia antica nel Medioevo ebraico* (Brescia: Paideia, 1996), pp. 256–74.

41 See Zonta, *Filosofia antica*, p. 267 n. 25.

42 See Rothschild, "Questions," pp. 112 and 114.

43 See Mauro Zonta, "Arabic and Latin Glosses in Medieval Hebrew Translations of Philosophical Texts and Their Relation to Hebrew Philosophical Dictionaries," in Jacqueline Hamesse and Danielle Jacquart, eds., *Lexiques bilingues dans les domaines philosophique et scientifique (Moyen Age – Renaissance)* (Turnhout: Brepols, 2001), pp. 31–48, esp. pp. 47–8; see also Zonta, *Hebrew Scholasticism*, pp. 182–4.

44 The most recent article about the Hebrew tradition of this work is Y. Tzvi Langermann, "Another Hebrew Version of the *Philosophia pauperum*," *Qiryat Sefer* 64 (1993): 1103–4 (in Hebrew). It is remarkable that, according to Langermann, the first Hebrew version of the *Philosophia pauperum* may have been made in Germany around 1300, in a place where there seem to be no other traces of a medieval Jewish interest in Latin Scholastic physics (and in Scholastic philosophy in general).

45 The fragment is found in the introduction of Baruch Ibn Yaʿish's own *Commentary on the Nicomachean Ethics*, in the *reportatio* of his pupil Samuel Altortos; on which see Zonta, *Hebrew Scholasticism*, pp. 121–3.

ITALY

Nonetheless, Hebrew Scholasticism was not a totally new phenomenon in medieval Jewish thought. Before it emerged in fifteenth-century Spain, an analogous movement had appeared in fourteenth-century Italy, where there were regular contacts between Jewish philosophers and Christian scholars. It is well known that a group of Jewish philosophers, active in central and southern Italy (especially Rome) between 1250 and 1350, were in close contact with their Christian colleagues: They absorbed Christian doctrines and methods and applied them to questions specific to Jewish philosophy. Moses of Salerno, in his commentary on Maimonides' *Guide of the Perplexed*, written around 1270, often refers to his past cooperation, in Naples, with the Christian scholars Nicholas of Giovinazzo and Peter of Hibernia (one of the teachers of Thomas Aquinas).[46] The most important thinker in this group, and in a sense the first true "Hebrew Schoolman," was Judah Romano, active at the court of Robert of Anjou, probably between 1310 and 1330. His Hebrew Scholastic works concerned physics, too. They included passages on physical topics taken explicitly from various Scholastic sources or direct translations from Latin commentaries on Aristotle's *Physics*. The former are the "discourses on physics" (*maʾamarim ṭivʿiyyim*) that are part of Judah's "philosophical anthology," whose contents and sources have been recently analyzed in detail by Caterina Rigo.[47] In this anthology, Judah renders into Hebrew passages from the *De anima* of Albertus Magnus (1193–1280), the *Commentary on the Posterior Analytics* by Giles of Rome (1243–1316), and the *Commentary on the Metaphysics* by Alexander Bonini of Alessandria (1270–1314), all of which, according to Judah, deal with physics (most of them, however, are not about physics but about noetics, the science of the intellect). The translations – scattered in various works by Judah – are mostly quotations from Giles's *Commentary on the Physics*, including passages of Aristotle's text translated from Latin. According to Rigo, the quoted passages are as follows: two short passages from Books I and VIII of Giles's commentary, and a "physical" passage from his *Quaestiones quodlibetales*, found in Judah's commentary on Averroes' *De substantia orbis*; two other passages from Books III and IV of Giles's commentary, inserted in the aforementioned anthology; and a longer excerpt, with an independent manuscript tradition, corresponding to the third part of Book IV of Giles's *Commentary on the Physics* (*lectiones* 18–28). Thus it seems that Judah had no knowledge of the "new physics" created by Ockham and Buridan; his acquaintance with Scholastic physics seems to be limited to thirteenth-century Italian Scholasticism, with which Giles of Rome was affiliated.

Judah Romano's example was followed in the next century. Fifteenth-century Italy witnessed the appearance of a few representatives of a Hebrew Scholasticism. Most of them were close to the University of Padua, where Christian Schoolmen evinced a renewed interest in Averroes and the so-called fourteenth-century Latin Averroists (John of Jandun, Walter Burley). These Italian "Jewish Schoolmen" showed an interest in Scholastic physics that was deeper and wider than that of their Spanish counterparts. Their interest, however, pertained not to Scotist and Thomist physics or to Ockham's new physics, but rather to that of the Latin Averroists or of their contemporary Christian colleagues of the Paduan school. One of the best-known Jewish Schoolmen in Italy was Elia Del Medigo (1460–93), who was so

[46] See Caterina Rigo, "Per un'identificazione del 'sapiente cristiano' Nicola da Giovinazzo, collaboratore di rabbi Mošeh ben Šelomoh da Salerno," *Archivum fratrum praedicatorum* 69 (1999): 61–146.

[47] See Caterina Rigo, "Un'antologia filosofica di Yehuda b. Mosheh Romano," *Italia* 10 (1993): 73–104, esp. pp. 81, 97–8 (for two quotations from Giles's commentary on the *Physics*, the former regarded by Judah as "logical"), 95, 97 (the "physical questions" from Giles's commentary on the *Posterior Analytics*), 100–1 (from Albertus Magnus's *De anima*), and 103 (from Alexander Bonini's commentary on the *Metaphysics*). See also idem, "Egidio Romano nella cultura ebraica: le versioni di Yehudah b. Mosheh Romano," *Documenti e studi sulla tradizione filosofica medievale* 5 (1994): 397–437, esp. pp. 414, 420–3, 428, 432.

learned in Latin Scholasticism that he was able to write – in Latin! – commentaries on Aristotle and Averroes that applied the same technique as his sources. Thus there is no doubt about Del Medigo's full participation in contemporary Scholasticism, but his importance for the transmission of Scholastic physics to Jewish scholars is seriously limited by the fact that he wrote most of his works in Latin rather than in Hebrew. In addition, Del Medigo was more interested in metaphysics and noetics than in physics. (It seems that Del Medigo's only Scholastic works in Hebrew were commentaries on Averroes' *De substantia orbis* and *Treatises on Intellect and Conjunction*, probably translations of original Latin versions.)

As far as Scholastic physics is concerned, the real protagonist of fifteenth-century Italian Hebrew Scholasticism is Judah Messer Leon (1425–ca. 1498), who lived and worked in Padua, Ancona, Bologna, and Mantua. His pivotal role in the development of Hebrew Scholastic physics was overlooked until very recently, when new research led to the identification of hitherto unknown or neglected works. I have recently identified the text of his extensive commentary (including Scholastic questions) on Averroes' *Middle* and *Long Commentaries on the Physics*, Books I–III, as well as on the corresponding parts of Aristotle's *Physics* in a medieval Latin translation; Judah's commentary was written in Mantua, probably between 1473 and 1475.[48] I have also studied two anonymous Hebrew philosophical texts on the Scholastic interpretation of the *Physics*, which were probably written either by Judah Messer Leon himself or by one of his students: a commentary on the first five books of Aristotle's *Physics* in the form of conclusions, found in a Paris manuscript, and a sort of partial supercommentary on this text, dealing with Books I–II and part of Book IV of the *Physics*.[49] In the case of Judah Messer Leon, and of these writings in particular, the direct use of Scholastic physics is general and (in most cases) explicit. Recently, I have shown that the main sources of the aforementioned commentary on the *Physics* are the works of two fifteenth-century Paduan professors: the *Recollectae super octo libros Physicorum* by Gaetano de' Thiene (1387–1465), especially for the many questions, which are true Scholastic *quaestiones disputatae*, inserted into Judah Messer Leon's text; the *Summa naturalium* by Paul of Venice (1369–1429); and the commentaries on the *Physics* by John of Jandun and Walter Burley. In some places there are also direct references to the commentaries on the *Physics* by Aquinas, Giles of Rome, and even William of Ockham.[50] Literal quotations from these works, often with explicit attribution, are incorporated into this text, which thus has the same arrangement as a discussion of Scholastic physics in contemporary commentaries on the *Physics* written by the professors of the University of Padua. As a matter of fact, Judah's commentary may have been modeled on the *Expositio super octo libros Physicorum necnon super Commento Averrois* by Paul of Venice, with its parallel interpretations of Aristotle's text and Averroes' *Long Commentary* on the *Physics*, plus the usual *quaestiones*.

Finally, we must note that Scholastic models and doctrines clearly inspired the Hebrew text of "conclusions" on *Physics* I–V, already mentioned. It can be ascribed to Judah's school, for its

48 Mauro Zonta, "Aristotle's *Physics* in Late-Medieval Jewish Philosophy (14th–15th Century) and a Newly-Identified Commentary by Yehudah Messer Leon," *Micrologus* 9 (2001): 203–17.

49 Mauro Zonta, "New Data on Judah Messer Leon's Commentaries on the *Physics*," *Aleph* 1 (2001): 307–23.

50 See Mauro Zonta, "Scholastic Commentaries in Hebrew: Some Notes about Judah Messer Leon (Italy, 15th Century)," in Gianfranco Fioravanti, Claudio Leonardi, and Stefano Perfetti, eds., *Il commento filosofico nell'Occidente latino (secoli XIII–XV)* (Turnhout: Brepols, 2002), pp. 379–400, esp. pp. 380–3 and 391–9. See also the detailed analysis of the introduction to Messer Leon's commentary and of the explicit Scholastic sources quoted in its first book, Zonta, *Hebrew Scholasticism*, pp. 217–72. For a list of the Latin sources quoted in Books I–III, see idem, "The Knowledge of Latin Philosophical Literature among Jewish Philosophers in 15th-Century Italy: Scholastic Sources in Yehudah Messer Leon's Commentary on Aristotle's *Physics*," in Giulio Busi, ed., *Hebrew to Latin, Latin to Hebrew: The Mirroring of Two Cultures in the Age of Humanism* (Berlin and Turin: Institut für Judaistik and Nino Aragno Editore, 2006), pp. 133–66.

main source is the "conclusions" inserted into Walter Burley's commentary. In addition, the literary genre of "conclusions" was widely employed in the Paduan School (Paul of Venice, among others, wrote many now-lost *conclusiones* on many of Aristotle's works).

Jewish philosophy and science in fifteenth-century Spain and Italy thus clearly exhibit direct knowledge of and a close relationship to and dependence on Scholasticism, and on Scholastic physics in particular. Whether a similar phenomenon existed in Provence during the fourteenth century, at least in isolated cases, only future research can tell.

12

Meteorology and Zoology in Medieval Hebrew Texts

Resianne Fontaine

METEOROLOGY

During the Middle Ages, both Muslim and Jewish scholars displayed a great interest in the study of *meteora*, a term that covered a wide variety of phenomena, some of which we would describe today as astronomical or seismological rather than as meteorological.[1] Their principal source was Aristotle's *Meteorology*, which, in the commonly accepted order of learning, was the fourth of his treatises on natural philosophy. The topics investigated by Aristotle are the stratification of the atmosphere, cloud formation, the Milky Way and comets, all forms of precipitation (rain, snow, hail, etc.), and rivers and springs (Book I); seas, winds, earthquakes, and thunder and lightning (Book II); and whirlwinds, thunderbolts, halos, rainbows, and rods (Book III). Aristotle's explanations of these phenomena are based on his theory of exhalation: The moist and the dry exhalations that are constantly drawn up from the earth by the heat of the sun generate these phenomena. The subject matter of Book IV – the effects of heat and cold on various bodies and the formation of homogeneous bodies – has little or no connection to the preceding books.

Medieval Arabic philosophers and scholars referred to this discipline as "the upper phenomena" (*al-āthār al-ʿulwiyya*). Their views are found in a considerable number of treatises, encyclopedic texts, and *adab* works. The history of the study of meteorology in the Arabic tradition was recently surveyed by Paul Lettinck.[2] He examined the reception-history and development of Aristotle's *Meteorology* and its Greek commentators, starting with its translation into Arabic in the ninth century, continuing with the writings of Muslim philosophers such as al-Kindī, Ibn Sīnā and his pupils, Ibn Bājja, and Ibn Rushd, and the meteorological sections of some medieval Arabic encyclopedias.

The corpus of medieval Hebrew texts on meteorology is less extensive than its Arabic counterpart. Although we lack an up-to-date survey of the relevant material comparable to what is now available for the Arabic tradition,[3] the past decades have witnessed vivid scholarly

[1] On ancient meteorology, see Otto Gilbert, *Die meteorologischen Theorien des griechischen Altertums* (Leipzig: Teubner, 1907); Liba Taub, *Ancient Meteorology* (London: Routledge, 2003).

[2] Paul Lettinck, *Aristotle's* Meteorology *and Its Reception in the Arab World: With an Edition and Translation of Ibn Suwār's* Treatise on Meteorological Phenomena *and Ibn Bājja's* Commentary on the Meteorology (Leiden: Brill, 1999). Lettinck's main focus is on the Muslim philosophers. For a list of authors who include meteorological material in encyclopedic works, *adab* works, or both, see pp. 1–2.

[3] Moritz Steinschneider's useful overview in his *Die hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893; hereinafter *HÜ*), Sections 61–4, is now partly outdated.

I would like to thank Prof. Mauro Zonta for critically reading this paper.

interest in the medieval Hebrew meteorological tradition, and a number of studies in this field have appeared. Here I survey the results of this scholarship and note the areas still to be explored.

Texts, Transmission, Sources, and Approaches

The body of medieval Hebrew texts concerned with meteorological topics consists primarily of translations, scientific encyclopedias, and philosophical commentaries. In addition, meteorological issues were treated in works of biblical exegesis or within an exegetical context and, to some extent, in popular literary works. After a brief enumeration of the relevant philosophical-scientific texts in chronological order, I proceed to discuss them in more detail, with special attention to the problem of the reliability of the Arabic Aristotelian text on which all of them were based. Then I will turn to the meteorological material in popular and exegetical contexts.

The reception of Aristotle's *Meteorology* in Hebrew begins in 1210 with Samuel Ibn Tibbon's *ʾOtot ha-shamayim* (The Signs of Heaven), a Hebrew version of the Arabic paraphrase of Aristotle's *Meteorology* by Yaḥyā Ibn al-Biṭrīq (ca. 830). In the course of the thirteenth century, four encyclopedic texts were produced that contain sections devoted to meteorology, namely *Midrash ha-ḥokmah* (The Exposition of Science), *Ruaḥ ḥen* (Spirit of Grace), *Deʿot ha-filosofim* (The Opinions of the Philosophers), and *Shaʿar ha-shamayim* (The Gate of Heaven). Around the middle of the thirteenth century, Moses Ibn Tibbon translated Ibn Rushd's Epitome of *Meteorology* into Hebrew as *Sefer ʾOtot ha-ʿelyonot* (The Upper Signs). In 1316, Qalonymus ben Qalonymos translated Ibn Rushd's Middle Commentary under the same title, *Sefer ha-ʾOtot ha-ʿelyonot*. A few years later, Gersonides wrote his supercommentary on Ibn Rushd's Epitome (1321/2); his student Solomon of Urgul wrote another. Later in the fourteenth century, Meir Aldabi included meteorological material in his encyclopedic *Shevilei ʾemunah* (Paths of Faith); so, more than a century later and in a different cultural context, did Yoḥanan Alemanno in his *Ḥai ha-ʿolamim* (Eternal Life). The corpus also includes two Latin-to-Hebrew translations (one Sephardi and one Ashkenazi) of sections from the *Philosophia Pauperum*.[4] Finally, it is worth mentioning that a few Arabic texts affiliated with a different, though related, genre, scientific weather forecasting, are available in Hebrew translation. These are translations of two treatises on the subject by al-Kindī.[5]

[4] Only three of these texts are available in critical editions: (1) Ibn Tibbon's *ʾOtot ha-Shamayim*: Resianne Fontaine, *Otot ha-Shamayim, Samuel Ibn Tibbon's Hebrew Version of Aristotle's* Meteorology: *A Critical Edition with Introduction, Translation, and Index* (Leiden: Brill, 1995); (2) the Hebrew translation of Ibn Rushd's Middle Commentary: I. M. Levey, "The Middle Commentary of Averroes on Aristotle's *Meteorologica*; Hebrew Translation of Kalonymos ben Kalonymos: Edited, with Introduction, Critical Apparatus and Hebrew-Arabic Vocabulary," Ph.D. dissertation, Harvard University, 1947; (3) Gersonides' supercommentary, Books 1–3: Eyal Meiron, "Gersonides' Supercommentary on Averroes' Epitome of *Meteorology* 1–3: A Comparative Analysis of the Optical-Physical-Mathematical Aspects of the Theories of the Halo and the Rainbow with an Appendix containing an Annotated Critical Edition," Ph.D. dissertation, Hebrew University of Jerusalem, 2003 (in Hebrew). There are nineteenth-century and older printings of *Ruaḥ ḥen* and *Shaʿar ha-shamayim*. *Shevilei ʾemunah* is available in a modern reprint (Lemberg, 1859; repr. Jerusalem: Baqal, 1985). The other texts mentioned in this paragraph are still in manuscript form. I am preparing an edition of the section of *Midrash ha-ḥokmah* on natural philosophy, which includes meteorology. Regrettably, only two of these texts have been translated into English, namely Samuel Ibn Tibbon's translation (ed. Fontaine) and Gershom ben Solomon's encyclopedia (F. Bodenheimer, *Gershon ben Shlomo: The Gate of Heaven* [Jerusalem: Turim Press, 1953]). There are no modern translations of Ibn Rushd's commentaries in their Arabic or Hebrew versions, nor of his Hebrew interpreters – a circumstance that, needless to say, is not conducive to comparative research in this field. Editions of Moses Ibn Tibbon's translation of Ibn Rushd's Epitome and of the relevant section of Ibn Falaquera's *Deʿot ha-filosofim* are major desiderata.

[5] See Gerrit Bos and Charles Burnett, *Scientific Weather Forecasting in the Middle Ages: The Writings of al-Kindī: Studies, Editions, and Translations of the Arabic, Hebrew and Latin Texts* (London: Kegan Paul, 2000). Chapter III (pp. 41–64) provides a survey of material on popular and scientific weather prognostication in the Hebrew tradition.

The following texts from the Arabic meteorological corpus do not seem to have been translated into Hebrew: Ḥunayn Ibn Isḥāq's *Compendium*, the commentaries on *Meteorology* by Alexander and Olympiodorus, Pseudo-Olympiodorus, Ibn Suwār, and Ibn Bājja's Commentary on *Meteorology*.[6] As we will see, however, traces of some of these texts can be found in the Hebrew tradition.

Philosophical-Scientific Texts

Somewhat surprisingly, *Meteorology* was the first Aristotelian treatise to be translated into Hebrew.[7] The translator, Samuel Ibn Tibbon (ca. 1160–ca. 1232), who lived and worked in southern France, states in his introduction to *ʾOtot ha-shamayim* that he embarked upon his translation at the request of R. Joseph ben Israel, and that he did so reluctantly. Nevertheless, there are reasons for assuming that he had a personal interest in the text, as we shall see in the subsequent section on Meteorology and Biblical Exegesis. One of the problems he faced was the defective and confused character of his Arabic *Vorlage*. In fact, Ibn al-Biṭrīq's Arabic version of *Meteorology* is more a paraphrase than a translation, with a number of deviations from and omissions with respect to the Greek text. To some extent the confusion that plagues the Arabic text may derive from Aristotle himself, some of whose explanations of meteorological phenomena are phrased ambiguously or are marred by inconsistencies and obscurities. [8] Cases in point are his discussions of the colors of the rainbow and the salinity of the sea.[9] The omissions and deviations, however, must be due either to Ibn al-Biṭrīq himself or to his immediate source (Greek or Syriac).[10]

In an attempt to remedy the shortcomings of his source text, Ibn Tibbon drew on the commentary by Alexander of Aphrodisias (available to him in the Arabic translation by Yaḥyā Ibn ʿAdī, tenth century) and to Ibn Rushd's Epitome. He frequently introduces extracts from these commentaries in his translation, indicating clearly where these interpolations begin and end. Ibn Tibbon's use of Alexander's commentary is all the more important because its Arabic translation has been lost. *ʾOtot ha-shamayim* seems to be the first Hebrew text to draw on a commentary by Ibn Rushd. In two places Samuel Ibn Tibbon also quotes the section on meteorology from Ibn Sīnā's *Shifāʾ*. Moreover, he compared his own manuscript of Ibn al-Biṭrīq's paraphrase with other copies he found in Barcelona and Toledo. As a result, the Hebrew version of *Meteorology* is not only much longer than its Arabic model but also closer to Aristotle's text.[11] Ibn Tibbon's additions concern the position of fire and air in relation to the ether, cloud formation, the origin of rivers and seas, the dry and moist places of the earth, the origin of winds, the downward motion of winds in thunderbolts, and earthquakes.[12]

As for the encyclopedias, the earliest account of meteorology appears in *Midrash ha-ḥokmah*, a survey of the sciences that must have been written in Toledo during the early

6 For these texts, see Lettinck, *Aristotle's* Meteorology *and Its Reception*, pp. 1–14.

7 Cf. the subsequent section on Meteorology and Biblical Exegesis.

8 See Lettinck, *Aristotle's* Meteorology *and its Reception*, pp. 45–6; Meiron, "Gersonides' Supercommentary," p. ix. Aristotle noted that the study of the *meteora* contains problems and puzzles (cf. *Meteorology* 339a3).

9 See Resianne Fontaine, "Red and Yellow, Blue and Green: The Colours of the Rainbow according to Medieval Hebrew and Arabic Texts," in Yosef Tobi, ed., *ʿEver and ʿArav: Contacts between Arabic Literature and Jewish Literature in the Middle Ages and Modern Times* (Tel Aviv: Afikim, 1998), pp. vii–xxv; idem, "Why Is the Sea Salty? The Discussion of Salinity in Hebrew Texts of the Thirteenth Century," *Arabic Sciences and Philosophy* 5 (1995): 195–218.

10 Cf. Lettinck, *Aristotle's* Meteorology *and Its Reception*, p. 8: "There is no final answer on the question how the original Aristotelian text became what is Ibn al-Biṭrīq's version." Cf. also Pieter L. Schoonheim, ed., *Aristotle's* Meteorology *in the Arabico-Latin Tradition: A Critical Edition of the Texts, with Introduction and Indices* (Leiden: Brill, 2000), pp. xiii–xiv.

11 This is valid for Books I–III. Ibn Tibbon did not insert comments in Book IV.

12 For a more detailed account of Ibn Tibbon's insertions and his use of Alexander of Aphrodisias, Ibn Rushd, and Ibn Sina, see Fontaine, *Otot ha-Shamayim*, pp. xxxix–lxxi.

1230s. The author, Judah ben Solomon ha-Kohen, states that he composed the work in Arabic, but it survives only in the author's own Hebrew translation, executed in Italy around 1247.[13] Judah's goal was to disseminate scientific knowledge among the Jews. To this end he provided a survey of Aristotelian philosophy, based on Ibn Rushd's commentaries. His excerpt from *Meteorology* appears in the section on natural philosophy, which includes brief accounts of *Physics*, *On the Heavens*, *On Generation and Corruption*, *On Air* (that is, *Meteorology*), *On the Animals*, *On the Soul*, and the *Parva Naturalia*.

As I have shown elsewhere, Judah displays no familiarity with Ibn Tibbon's translation.[14] He drew instead on the Arabic original of Ibn Rushd's commentaries, especially the Middle Commentary. At times he preferred the Epitome as a source text; occasionally he used Ibn Sina's *Shifāʾ* as well. In fact, Judah's survey consists of alternating paraphrases and abridged literal translations of Ibn Rushd's text. The terminology is totally different from that coined by Samuel Ibn Tibbon and may be described as "idiosyncratic."[15]

His familiarity with Ibn Rushd's commentaries must have made Judah aware of the problems related to the transmission of the text. Like Ibn Tibbon, Ibn Rushd compared Ibn al-Biṭrīq's version (referred to by him as "the version that has come down to us"), which formed the basis of his two commentaries, with the commentary by Alexander of Aphrodisias; in his Middle Commentary, he recorded several discrepancies between the two texts. In general, Ibn Rushd's response to the divergent explanations found in Alexander and Ibn al-Biṭrīq was to harmonize them or to simply record them and leave the matter up in the air.[16] When describing the differences between the two texts, he sometimes includes his own observations of the phenomenon in question. Nevertheless, Judah ben Solomon does not take notice of the textual problems and contents himself with incorporating, with no further explanation, some of Ibn Rushd's comments on the divergent views, while skipping others. His silence in this regard is probably due to his general concern for brevity: In his endeavor to spread scientific knowledge, he limits himself to highlighting the main points of the source he is excerpting without going into great detail.

In the second of the three major thirteenth-century Hebrew encyclopedias, Shem-Ṭov Ibn Falaquera's *Deʿot ha-filosofim* (ca. 1260), the section on meteorology (entitled *ba-Rishumim ha-ʿelyonim*) again appears as part of a survey of natural philosophy. This author, too, was fluent in Arabic and sought to disseminate the secular knowledge he absorbed in that language to a Hebrew-reading public.[17] Like the author of the *Midrash ha-ḥoḵmah*, Falaquera used Ibn Rushd's two commentaries as his major sources, but unlike the first encyclopedia, the relevant section in the *Deʿot* consists largely of literal translations of its sources, alternating between the Epitome and the Middle Commentary.[18] Elsewhere I have argued that Falaquera's method of creatively combining Ibn Rushd's two commentaries in this section of the

[13] For the work and its author, see Steinschneider, *HÜ*, Section 1; Colette Sirat, "Judah b. Salomon Ha-Cohen, philosophe, astronome et peut-être kabbaliste de la première moitié du XIII^e siècle," *Italia* 2 (1977): 39–61; R. Fontaine, "Judah ben Solomon ha-Cohen's *Midrash ha-Hokhmah*: Its Sources and Use of Sources," in Steven Harvey, ed., *The Medieval Hebrew Encyclopedias of Science and Philosophy* (Dordrecht: Kluwer, 2000), pp. 191–210.

[14] See Resianne Fontaine, "The Reception of Aristotle's *Meteorology* in Hebrew Scientific Writings of the Thirteenth Century," *Aleph* 1 (2001): 101–39, on pp. 116–17.

[15] See Fontaine, "Arabic Terms in Judah ben Solomon ha-Cohen's *Midrash ha-Hokhma*," *Dutch Studies published by NELL* 3(1–2) (1977): 121–31.

[16] I have dealt more fully with some of the discrepancies noted by Ibn Rushd and how the Hebrew encyclopedists approached them in "The Reception of Aristotle's *Meteorology*." The discrepancies discussed there (pp. 110–12) concern issues related to winds and earthquakes.

[17] For an outline of the contents of this encyclopedia, see Raphael Jospe, "Shem-Tov ben Joseph ibn Falaquera's *Deʿot ha-Filosofim*," in Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 238–47.

[18] For *Deʿot ha-filosofim* and its use of Ibn Rushd's commentaries, see Steven Harvey, "Shem-Tov Ibn Falaquera's *Deʿot ha-Filosofim*: Its Sources and Use of Sources," in Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 211–37.

Deʿot clarified and systematized Ibn Rushd's account and provided a coherent exposition.[19] Moreover, in combining his sources, he suggests solutions for some of the problematic passages. His approach is not consistent, however, for in other places he refrains from dealing with the conflicting views.[20] Moreover, it is noteworthy that, through his extensive use of Ibn Rushd's commentaries, Falaquera records, knowingly or unknowingly, the interpretations of Aristotle's Greek commentators and Ibn Bājja; this topic requires further study.[21]

There are some indications that Falaquera was acquainted with Ibn Tibbon's *ʾOtot*, although he does not seem to have actually used it.[22] His terminology, however, is much closer to that of *ʾOtot* than to *Midrash ha-ḥoḵmah*, with some occasional deviations.

The third encyclopedia, *Shaʿar ha-shamayim* (ca. 1300), was much more influential than the other two compilations. Unlike Judah ha-Kohen and Falaquera, Gershom (or Gershon) ben Solomon of Arles did not read Arabic and had to draw on *ʾOtot ha-shamayim* for his treatment of meteorology. Like the two earlier encyclopedias, *Shaʿar ha-shamayim* presents meteorology as part of an exposition of natural philosophy, but transposes it to the beginning of the work (Book I, chapters 2–7). In these sections Gershom ben Solomon used *ʾOtot ha-shamayim* as his source text, rearranging it and supplementing it with two other texts by Samuel Ibn Tibbon, *Maʾamar Yiqqawu ha-mayim* and the commentary on Ecclesiastes.[23] The meteorological account is preceded by an exposition on the four elements and the differentiation of the spheres of fire and air (*Shaʿar ha-shamayim* Book I, chapter 1), which seems to be meant as an introduction to meteorology proper. In this section Gershom used various sources, again including Ibn Tibbon's *ʾOtot* and *Maʾamar Yiqqawu ha-mayim*, as well as the *Guide of the Perplexed*, rearranging them freely.[24] Another source text may have been *Ruaḥ ḥen*, to be subsequently discussed.[25]

Like the two earlier encyclopedists, Gershom does not explicitly refer to the textual problems that preoccupied Ibn Tibbon. However, it is clear that he has benefited from his source's comparison of the two accounts available to him: In various passages Gershom puts forward Alexander's explanation as quoted by Ibn Tibbon, that is, the reconstructed Aristotelian account, while mentioning as "another view" the erroneous interpretation found in Ibn al-Biṭrīq.[26]

A fourth encyclopedia is the much less extensive *Ruaḥ ḥen,* whose authorship remains uncertain.[27] In all probability it was written during the first half of the thirteenth century.[28] Although encyclopedic in content, it does not seek to spread contemporary scientific knowledge as such, as the other thirteenth-century encyclopedias did. Instead, it aims to facilitate understanding of Maimonides' *Guide*. This certainly determined the selection of the themes covered by this mini-encyclopedia. The only meteorological topic that *Ruaḥ ḥen* discusses, and that at some length, is the stratification of the atmosphere, that is, the various layers of air and fire (chapter 7). The reason for its inclusion becomes clear toward the end of the

[19] Fontaine, "The Reception," pp. 120–1.

[20] Ibid., pp. 121–6.

[21] Ibid., p. 133 n. 96.

[22] Ibid., pp. 118–19.

[23] See James T. Robinson, "Gershom ben Solomon of Arles' *Shaʿar ha-Shamayim*: Its Sources and Use of Sources," in *Medieval Hebrew Encyclopedias*, ed. Harvey, pp. 248–74, on p. 255.

[24] Ibid., p. 256. Robinson avers (n. 35) that "Averroes' commentary/ies on *On the Heavens*... is also a likely source."

[25] Cf. Fontaine, "The Reception," pp. 127–8.

[26] Ibid., pp. 128–32.

[27] Colette Sirat has argued that *Ruaḥ ḥen* cannot be attributed to any of the three persons who have been suggested as authors, namely Judah Ibn Tibbon, Samuel Ibn Tibbon, and Jacob Anatoli. See Colette Sirat, "Le livre *Rouah Hen*," *Proceedings of the Sixth World Congress of Jewish Studies* (Jerusalem: World Union of Jewish Studies, 1977), Vol. 3, pp. 117–23.

[28] Research on this intriguing text is currently being carried out by Ofer Elior (Jerusalem).

chapter: It is relevant for the correct interpretation of Gen. 1:6 and 2:6 and of the rabbinic reference to *šayiš ṭahor*, as discussed by Maimonides.[29] Although the text seems to refer to *ʾOtot ha-shamayim* by name and shows some similarity to it, including the terminology, *Ruaḥ ḥen* goes into more detail on the subject. It also advances a number of ideas not found in Samuel Ibn Tibbon's version. It is clear, however, that the author was well familiar with the subject.[30]

As this overview reveals, most of the Hebrew authors who discussed meteorology were aware of the problems involved in the transmission of Aristotle's *Meteorology* in Arabic, and some tried to remedy the situation in one way or another. Despite their efforts, *Meteorology* remained a difficult text for its expositors. Neither Samuel Ibn Tibbon nor later Hebrew authors who relied on Ibn Rushd could find clear-cut solutions in his commentaries for all the problems, and they were often left to their own devices.

All this implies that medieval Jewish students who wished to learn about meteorology had to rely on information that was based on a corrupt text plagued by vagueness. We may wonder, then, whether the meteorological explanations that were current were at all comprehensible to readers. How well did they actually understand the texts they were studying? More generally, does *Meteorology*, because of the faulty transmission of the text and the difficulty of the subject, represent a special case within the Aristotelian corpus as studied by medieval Jewish scholars? Does the medieval reception and study of this discipline differ from that of other branches of natural knowledge, where Aristotle likewise bequeathed unsolved problems to later generations but where the text was available in better translations? In a similar vein, were Latin students of *Meteorology* better off when the old Latin translation by Gerard of Cremona (produced between 1150 and 1187), based on Ibn al-Biṭrīq's version, was superseded by that of William of Moerbeke (after 1268)?[31]

Such questions cannot be addressed until the relations among all texts in the medieval meteorological corpus have been studied thoroughly, as well as the treatment of specific topics by the various medieval authors.[32] Only when this has been accomplished will it be possible to decide whether the situation improved after the thirteenth century. Eyal Meiron recently investigated Gersonides' use of Ibn Rushd's two commentaries and his treatment (in his supercommentary) of the halo and the rainbow.[33] He concluded that even an exceptional scientist such as Gersonides, who made some important innovations, did not fully overcome the inconsistencies in Ibn Rushd's commentaries.[34]

Later medieval Hebrew meteorological texts, including commentaries and sections in encyclopedias, have not yet been studied in depth. As for Solomon of Urgul, Ruth Glasner has shown that his supercommentary on *Meteorology* contains what is "almost certainly a reference to Levi ben Gershom's criticism of Ibn Rushd's interpretation of the colors of the second rainbow, and perhaps also to the vagueness of Levi ben Gershom's own explanation."[35]

[29] B Ḥagigah 14b; see Fontaine, "The Reception," pp. 107–8.

[30] On the late thirteenth-century encyclopedia *Liwyat ḥen*, by Levi ben Abraham of Villefranches, see the subsequent section: Meteorology and Biblical Exegesis.

[31] See Schoonheim, *Aristotle's* Meteorology *in the Arabico-Latin Tradition*, p. xviii.

[32] Only a few studies about specific meteorological themes are available. Apart from the articles mentioned in n. 9, see Resianne Fontaine, "Between Scorching Heat and Freezing Cold: Medieval Jewish Authors on the Inhabited and Uninhabited Parts of the Earth," *Arabic Sciences and Philosophy* 10 (2000): 101–39; Ruth Glasner, review of Fontaine, *Otot ha-Shamayim*, *Jewish Quarterly Review* 88 (1998): 296–309. See also next note.

[33] Meiron, "Gersonides' Supercommentary."

[34] Ibid., p. xiv.

[35] Ruth Glasner, "Levi ben Gershom and the Study of Ibn Rushd in the Fourteenth Century," *Jewish Quarterly Review* 86 (1995): 51–90, on p. 68. According to Glasner (p. 61 n. 47), Urgul's commentaries are based on Moses Ibn Tibbon's translations.

Meir Aldabi's *Shevilei ʾemunah*, an encyclopedic text dating from 1360 and probably written in Jerusalem, contains information on the inhabited world (Book II, chapter 2) and on winds, earthquakes, thunder, and the rainbow (end of Book II, chapter 4).[36] The author discusses these last four issues as a kind of appendix to the fourth and last section of the second "path," which deals with the spheres of the sun and the moon. No one has examined Aldabi's selection of these topics. The prevailing thesis that Aldabi's major source was Gershom ben Solomon's *Shaʿar ha-shamayim* is not valid for this "appendix"; my own perusal of it suggests that Aldabi took his information from *Midrash ha-ḥoḵmah*.[37] Mention should also be made of the untitled Judeo-Italian encyclopedia on natural philosophy by Moses of Rieti (1388–1460?), with a section on meteorology that has many similarities to *Shaʿar ha-shamayim*.[38]

As for later material, Yoḥanan Alemanno's voluminous *Ḥai ha-ʿolamim*, written in Italy in the late fifteenth century, is extant only in manuscript form.[39] Its discussion of the natural world includes topics related to meteorology, along with descriptions of phenomena witnessed by the author or others.[40] Other relevant late medieval texts are the two Latin-to-Hebrew translations of Pseudo-Albertus's *Philosophia Pauperum*, a Sephardi one by Abraham Shalom and an anonymous Ashkenazi version, discovered by Y. Tzvi Langermann. In an initial comparison, Langermann observed that there are interesting differences between them in their method of translation and attitude toward Christianity.[41] The existence of these two translations testifies to some interest in meteorology among Jewish scholars during the Late Middle Ages. This circumstance is noteworthy, in view of Dov Schwartz's suggestion that over the course of time, the translations of Ibn Rushd's commentaries on *Physics* and *Metaphysics* shunted meteorology to a marginal place in the medieval scientific curriculum.[42] It is true that the bulk of the medieval meteorological corpus was produced in the thirteenth and the first half of the fourteenth centuries and that the number of philosophical-scientific texts on meteorology later than the supercommentaries by Gersonides and Solomon of Urgul is not impressive. Nonetheless, Schwartz's assumption seems to be inconsistent with the fact that more than half of the twenty-two extant manuscripts of *ʾOtot ha-shamayim* date from the fifteenth century.[43] Moreover, we invariably find *Meteorology* included in manuscripts that contain the Hebrew translations of Ibn Rushd's commentaries on Aristotle's writings on natural philosophy, both the Epitome and the Middle Commentary. This suggests a continuous and comprehensive tradition of study, for it is hardly conceivable that these texts were copied just for the sake of completeness. In other words, the role of the study of meteorology in the scientific curriculum and its importance vis-à-vis other disciplines of

[36] In the 1708 Amsterdam edition, these sections are on ff. 18b–19b and 29b–30b, respectively; ed. Jerusalem, 1985, pp. 47–50 and 65–7.

[37] See Resianne Fontaine, "An Unexpected Source of Meir Aldabi's *Shevilei Emunah*," *Zutot 2004* (2007): 98–102.

[38] Irene Hijmans-Tromp, ed., *Mose da Rieti. Filosofia Naturale e fatti de Dio. Testo inedito del secolo XV* (Leiden: Brill, 1989), pp. 527ff.

[39] According to Fabrizio Lelli, "L'educazione ebraica nella seconda meta del '400. Poetica e scienze naturali nel *Ḥay ha-ʿolamim* di Yoḥanan Alemanno," *Rinascimento* 36 (1996): 75–136, on p. 106, it was composed between 1469 and 1503.

[40] See Abraham Melamed, "The Hebrew Encyclopedias of the Renaissance," in Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 441–64.

[41] Y. Tzvi Langermann, "Tirgum ʿivri nosaf le-*Philosophia Pauperum*," *Qiryat Sefer* 64 (1993): 1103–4. Interestingly, in the last lines of the Ashkenazi translation, the words *ʾOtot ha-shamayim* appear. I discuss this translation in "An Anonymous Hebrew Translation of a Latin Text on Meteorology" (forthcoming).

[42] Dov Schwartz, "*ʾOtot ha-shamayim*. ʾAspaqlaryah la-ʾezoteriqah ha-yehudit bi-ymei ha-benayyim," *Daʿat* 38 (1997): 145–8, on p. 148.

[43] In this regard it is noteworthy that the Latin world displayed a vivid interest in the *Meteorology* during the fifteenth century; see Schoonheim, *Aristotle's* Meteorology *in the Arabico-Latin Tradition*, p. xviii.

science and natural philosophy are other issues that must be addressed once the entire corpus has been studied.

To evaluate the place of meteorology in the medieval curriculum, the presence of meteorological notions in popular medieval texts and in the Hebrew exegetical literature must also be taken into account. The first such literary text is Joseph ben Meir Ibn Zabara's *Sefer ha-Shaʿashuʿim* (Book of Amusements; end of the twelfth century). In one chapter of this delightful book, written in the *maqāmah* style, the two protagonists engage in a discussion of various scientific subjects, including the salinity of the sea and the formation of hail. The passages on meteorological questions appear to coincide almost word for word with the parallel discussions in *Shaʿar ha-shamayim.* According to Israel Davidson, who edited *Sefer ha-Shaʿashuʿim*, they are a later interpolation,[44] but this assumption requires further research. Whether or not these passages are a later interpolation, the question arises as to why these two meteorological topics were included in the text. Did the author or the interpolator add these topics merely with a view to amusing and entertaining his readers, or did he consider knowledge of them to be indispensable for educated people?[45]

Another *maqāmah*, Isaac Ibn Sahula's *Meshal ha-qadmoni* (1281), contains much more meteorological material. The animal characters of the book offer explanations or descriptions of the inhabited world, the two exhalations, earthquakes, thunder and lightning, and the rainbow, all in rhyme.[46] Although the ultimate source for the theories presented in this text is clearly Aristotle, the selection of subjects and the explanations is somewhat different from the views expounded in *ʾOtot ha-shamayim*; the terminology, too, differs at times.[47] A marked difference from all the other texts mentioned so far is the ethical context in which the meteorological themes are embedded here: The section on the inhabited world is part of the chapter on "reverence," and that on the exhalations is in the chapter on "penitence." Wholly in line with his pedagogical purposes, Ibn Sahula rounds off the discussion of meteorological phenomena with the observation that, notwithstanding all the scientific explanations presented by scholars, some secrets remain, because *when* these phenomena take place depends on God's will and mercy. Whereas *ḥakmei-ha-meḥqar* (i.e., philosophers or scientists) cannot understand God's mighty deeds, Ibn Sahula notes, this knowledge is not hidden from the wisdom that is derived from the prophetic tradition.[48]

Meteorology and Biblical Exegesis

Turning now to meteorological material in the exegetical literature, we should begin by noting that we are not dealing here with authors interested in *Meteorology* with a view to spreading scientific knowledge in an Averroian context, but with scholars concerned with the implications of meteorological theories. As noted, this is also what interested the author

44 Israel Davidson, ed., *Joseph ben Meir Ibn Zabara*: Sepher Shaashuim: *A Book of Mediaeval Lore* (New York: The Jewish Theological Seminary of America, 1914), pp. lxxii–lxxiv and lxxviii–lxxx.

45 The issue of the sea's salinity is also discussed in Berechiah b. Naṭronai ha-Naqdan's *Dodi we-neḵdi*, a scientific text that is an adaptation of the twelfth-century treatise *Quaestiones Naturales* by Adelard of Bath; see H. Gollancz, *Dodi ve-nechdi (Uncle and Nephew): The Work of Berachya Hanakdan* (London: Oxford University Press, 1920), Questions 6 and 8.

46 See Isaac ben Solomon Sahula, *Meshal Haqadmoni: Fables from the Distant Past,* ed. and trans. Raphael Loewe (Oxford: Littman Library of Jewish Civilization, 2004). For the section on the inhabited world, see Vol. 2, pp. 641–9 (lines 955–1053); for the other phenomena mentioned here, see Vol. 1, pp. 308–17 (lines 1697–1810). I would like to thank Prof. Loewe for kindly allowing me to use his page proofs while the book was still in press.

47 Cases in point are the explanation of thunder and the various shapes of lightning. Loewe does not deal with the question of Ibn Sahula's precise sources, but see his Table I (p. lxiii), "Suggested Derivation of Ideas," where he includes Samuel Ibn Tibbon's meteorology.

48 *Meshal Haqadmoni,* Vol. 1, pp. 315–17 (lines 1789–1810); cf. p. xxii.

of the *Ruaḥ ḥen*. The connection between meteorology and biblical exegesis goes back to *ʾOtot ha-shamayim* and perhaps even to Maimonides. As already noted, *Meteorology* was the first Aristotelian treatise to be translated into Hebrew. This remarkable fact was first noted by Moritz Steinschneider.[49] Almost a century later, Aviezer Ravitzky suggested that it was Ibn Tibbon's personal interest in this text that led him to translate it.[50] According to Ravitzky, Ibn Tibbon inferred from *Guide* Part II, chapter 30, where Maimonides speaks of *āthār*, that Maimonides viewed *Meteorology* as a semantic key for the correct interpretation of the biblical account of creation.[51] Ibn Tibbon consequently read the creation story as an allegory of the physical processes that take place on earth and in the atmosphere and of the causal order in nature. His conviction that meteorological theories provide the clue for the interpretation of the creation story is evident from the fact that he preferred a biblical quotation (the phrase *ʾotot ha-shamayim* comes from Jer. 10:2) as the title of his version over a literal rendering of the Arabic.[52] Moreover, his exegetical treatise *Maʾamar Yiqqawu ha-mayim* (written ca. 1231), which takes Gen. 1:9 – "Let the waters be gathered" – as its starting point, testifies to a sustained interest in Aristotle's meteorological ideas.

Sara Klein-Braslavy has discussed the Maimonidean background of Ibn Tibbon's esoteric line of interpretation, whereas Ravitzky has pointed to the differences between the views of Maimonides and of Ibn Tibbon.[53] Samuel Ibn Tibbon's esoteric interpretation of the creation story influenced a number of later thinkers, including Samuel Ibn Zarza, Abraham Bibago, and Isaac Arama, as has been pointed out by Dov Schwartz.[54] The theories elaborated in *Maʾamar Yiqqawu ha-mayim* elicited a critical response by Jacob Ibn Sheshet of Gerona in his *Meshiv devarim neḵoḥim* (1240?). Several scholars are now studying the use of *Meteorology* (and thus of *ʾOtot*) in medieval biblical (esoteric) exegesis. A major step forward is Gad Freudenthal's recent study of Samuel Ibn Tibbon's use of Ibn Sina's natural philosophy in the explanation of the creation story found in his *Maʾamar Yiqqawu ha-mayim*.[55] Another important contribution is Haim Kreisel's edition and study of the section on the firmament in *Liwyat ḥen*, an encyclopedic work by Levi ben Abraham of Villefranches.[56] Klein-Braslavy has studied Gersonides' use of meteorological theories to explain biblical miracles such as the pillar of fire (Exod. 13:21–22), the swallowing up of Koraḥ and his faction (Num. 16:31), the miraculous regression of the shadow performed for Hezekiah (2 Kings 30:10), and several others.[57] We may hope that these studies will lead to a comprehensive survey not only of the extent of meteorological elements in the exegetical literature but also of the role played by that genre in the dissemination of scientific knowledge.[58]

49 Steinschneider, *HÜ*, Section 132.

50 Aviezer Ravitzky, "Aristotle's *Meteorologica* and the Maimonidean Exegesis of Creation," *Jerusalem Studies of Jewish Thought* 9 (1990): 225–50, on p. 225 (in Hebrew).

51 Moses Maimonides, *The Guide of the Perplexed*, trans. Shlomo Pines, Part II, chapter 30 (Chicago: University of Chicago Press, 1963), p. 353. According to Y. Tzvi Langermann, *āthār* in this context refers to "traditions" and not to the *Meteorology*; see his review of Fontaine's edition of *Otot ha-Shamayim*, *Journal of Jewish Studies* 48 (1997): 389.

52 *Otot ha-Shamayim*, ed. Fontaine, pp. xiii–xiv.

53 Sara Klein-Braslavy, *Maimonides' Interpretation of the Story of Creation* (Jerusalem: Rubin Mass, 1987) (in Hebrew); Aviezer Ravitzky, "Aristotle's *Meteorologica*," pp. 233–8.

54 Schwartz, "*ʾOtot ha-Shamayim*," p. 148.

55 Gad Freudenthal, "Samuel Ibn Tibbon's Avicennian Theory of an Eternal World," *Aleph* 8 (2008): 41–129.

56 Howard Kreisel, ed., *Levi ben Avraham*: Livyat Ḥen: *Book Six Part Three: The Work of Creation* (Jerusalem: World Union of Jewish Studies, 2004) (in Hebrew).

57 Sara Klein-Braslavy, "Gersonides' Use of Aristotle's *Meteorology* in His Accounts of Some Biblical Miracles," *Aleph* 10.2 (2010): 241–313.

58 In this regard it should be noted that the author of the *Midrash ha-ḥoḵmah* refers to meteorological doctrines in the section of his encyclopedia that deals with biblical exegesis as well.

Another area that remains to be explored is the interest in and knowledge of meteorology and zoology on the part of Jews who wrote in Arabic. For example, Saadia's discussion of the disadvantages of a long life, in the last chapter of *Emunot we-deʿot*, compares an old person with a cloud from which the rain has vanished, so that only useless exhalations remain.[59] Meteorological discussions in biblical commentaries and commentaries on *Sefer Yeṣirah* are also likely to contain relevant material. A case in point is the commentary on *Sefer Yeṣirah* by Dunash Ibn Tamim of Kairouan (tenth century).[60] To date, however, there has been no systematic research on these writings or on the Arabic writings of Hebrew grammarians that may be relevant for the use of certain meteorological terms.

ZOOLOGY

Medieval Hebrew zoology was a neglected field until quite recently.[61] In a pioneering article published in 1996, Mauro Zonta made this observation: "An extensive study of the Hebrew zoological tradition in the Middle Ages with reference to its Arabic and Latin sources is still a desideratum."[62] This observation is still valid, although fortunately considerable progress has been made in the past decade, primarily thanks to Zonta's own investigations. Not only have his studies yielded important insights into the relations between the relevant Hebrew texts and their underlying sources, but they have also underscored the importance of Hebrew zoological writings for clarifying the transmission of Aristotle's zoological treatises in the Greek and Arabic traditions.

The three aforementioned thirteenth-century encyclopedias include extensive material on zoology. In their sections on natural philosophy, they provide systematic accounts of animals based on the Aristotelian–Averroian zoological tradition.[63] Each expounds this heritage to Hebrew readers in its own manner. *Midrash ha-ḥokmah* is based almost exclusively on Ibn Rushd's commentary on Aristotle's zoology, to which the author adds a few personal observations. Ibn Rushd's commentary, the only one he wrote on zoology, is limited to *De partibus animalium* and *De generatione animalium*, that is, the second and third parts of the composition that the Latin world knew as *De animalibus* (Arabic *Kitāb al-ḥayawān*). It is hard to establish whether it should be classified as an Epitome or a Middle Commentary, because it has features of both types. The author of *Midrash ha-ḥokmah* excerpts the nine books of his source, highlighting their main points. On a few occasions, however, he adds some personal observations; toward the end of his exposition of *De generatione animalium* Book IV, he supplements his scientific survey with a long quotation from B *Bekorot* 7b–8a.[64]

In the zoological section of *Deʿot ha-filosofim*, Falaquera, too, used Ibn Rushd's commentary as his primary source, occasionally interpolating additional material, including some passages from the Arabic translation of Aristotle's *De partibus animalium* and *De generatione animalium*.[65] He also offers a summary of *De historia animalium*, the first part of the *De animalibus* and more

59 Saadia Gaon, *ʾEmunot we-Deʿot* X.11, ed. Y. Kafaḥ (Jerusalem, 1970), p. 309 (Arabic and Hebrew).

60 Cf. Paul B. Fenton's new and expanded edition of Georges Vajda, ed., *Le Commentaire sur le* Livre de la Création *de Dūnaš ben Tāmim de Kairouan (Xe siècle)* (Louvain: Peeters, 2002), pp. 112–18.

61 Two studies appeared the 1950s: F. S. Bodenheimer and L. Kopf, "Two Chapters of a Hebrew Version of Aristotle's *Historia animalium*," in F. S. Bodenheimer, *Studies in Biology and Its History* (Jerusalem, 1957), pp. 91–105; idem, "The Biology of Abraham b. David Halevi of Toledo," *Archives internationales d'histoire des sciences* 4 (1951): 39–62.

62 Mauro Zonta, "Mineralogy, Botany and Zoology in Medieval Hebrew Encyclopedias," *Arabic Sciences and Philosophy* 6 (1996): 262–315, on p. 305. Zoology is discussed by Steinschneider, *HÜ*, Section 67.

63 For a survey see Zonta, "Mineralogy," pp. 262–315.

64 Cf. ibid., p. 307 n. 135.

65 Ibid., p. 308 n. 136; Zonta, "The Zoological Writings in the Hebrew Tradition," pp. 44–65 in Carlos Steel, Guy Guldentops, and Pieter Beullens, eds., *Aristotle's Animals in the Middle Ages and Renaissance* (Louvain: Louvain University Press, 1999), on p. 53.

descriptive in nature than the second and third parts, which present the scientific and theoretical aspects of Aristotle's zoology. As Zonta has shown, Falaquera also relied on Ibn al-Ṭayyib's *Tafsīr* of Aristotle's zoology, which contained a revision of the Arabic translation of the Aristotelian text, and on a paraphrase or epitome ascribed to Themistius.[66]

The author of *Shaʿar ha-shamayim*, Gershom ben Solomon, appears to have drawn on *Deʿot*. Zonta has conclusively demonstrated that, for his survey of the *Historia animalium*, Gershom had before him the Hebrew translation of the *Historia* made from Scotus's Latin translation of the Arabic version of Aristotle's zoology sometime during the second half of the thirteenth century.[67]

Ibn Rushd's commentary on *De partibus animalium* and *De generatione animalium* was translated into Hebrew by Jacob ben Makhir in 1302. Gersonides employed this text for his supercommentary, written in 1323. Of all these Hebrew texts (or any other Hebrew work on fauna), only Gersonides' supercommentary on *De partibus animalium* has been the subject of a critical edition.[68] As with *Meteorology*, then, the study of the Hebrew zoological corpus lags behind that of the Arabic and Latin traditions, where several important texts are available in print. Some projects are currently in progress, namely an edition of the relevant sections of *Midrash ha-ḥoḵmah* and an edition of the Hebrew translation of Ibn Rushd's commentary on Aristotle's *De animalibus*.[69]

Ibn Rushd's commentary thus appears to be a key text for medieval Hebrew zoology. The original Arabic text formed the basis of the Hebrew encyclopedias; the Hebrew translation is important both because it underlies Gersonides' supercommentary and because it is the earliest witness of Ibn Rushd's text, whose Arabic original has been lost. (The Latin translation is assumed to be based on the Hebrew.) This text is important for the study of Ibn Rushd's philosophical thought and not only his biology. Gad Freudenthal has drawn on it in a study of the change in Ibn Rushd's views as to the role of the active intellect and the celestial bodies in the generation of animate beings.[70] The commentary on *De animalibus* thus proves to be an important witness for this evolution in Ibn Rushd's thought. The subject matter of this commentary is thus extremely relevant for the study of Ibn Rushd's other commentaries and, more generally, for the impact of his thought on Jewish philosophers.

Another interesting aspect of this text is its sustained attention to the controversy between Aristotle and Galen. On various occasions Ibn Rushd mentions the divergent views of Aristotle and Galen on biological issues. In several cases the commentator tries to harmonize the differences between the two authorities by "Galenizing" Aristotle, that is, by interpreting the Aristotelian view in the light of Galen's teaching. Furthermore, his comments contain Galenic doctrines even though Ibn Rushd does not always acknowledge this. Given the use of this commentary by Hebrew authors such as the encyclopedists, this text is crucial for the history of Galenism in the Hebrew tradition. This history has not yet been the subject

[66] See Mauro Zonta, "Ibn al-Ṭayyib Zoologist and Ḥunayn Ibn Isḥāq's revision of Aristotle's *De Animalibus*: New Evidence from the Hebrew Tradition," *Aram* 3 (1991): 235–47.

[67] Zonta, "Zoological Writings," pp. 50–2. For more on descriptive Hebrew zoology and Latin-to-Hebrew translations, see Zonta, "Mineralogy," p. 280 n. 62.

[68] Ahuva Gaziel (ed.), "The Biology of Levi ben Gershom (Gersonides)" (in Hebrew), PhD thesis, Bar-Ilan University (Ramat Gan, 2008).

[69] My edition of the part of the *Midrash ha-ḥoḵmah* on natural philosophy will include the section on zoology. In addition, Prof. Gerrit Bos and I intend to prepare an edition of the Hebrew translation of Ibn Rushd's commentary.

[70] Gad Freudenthal, "The Medieval Astrologization of Aristotle's Biology: Averroes on the Role of the Celestial Bodies in the Generation of Animate Beings," *Arabic Sciences and Philosophy* 12 (2002): 111–37; idem, "Averroes' Changing Mind on the Role of the Active Intellect in the Generation of Animate Beings" (forthcoming). I thank Gad Freudenthal for providing me with a copy of this article.

of a detailed investigation; nor have Ibn Rushd's harmonizing procedure and its impact on Hebrew authors been studied systematically.[71]

A second key text here is Gershom ben Solomon's *Shaʿar ha-shamayim*, which seems to be an important link in the chain of transmission of Hebrew zoological knowledge. It clearly differs in character from the other two encyclopedias in that it is more descriptive and does not seem to depend directly on Ibn Rushd. *Shaʿar ha-shamayim* served as the basis for later encyclopedic compilations, such as *Sefer Toledot ha-ʾadam* by Joseph Israel ben Abraham;[72] it also has much in common with the aforementioned encyclopedia by Moses of Rieti.[73] A critical edition of this text, plus continued study of its sources, is a desideratum for the field of the history of zoology in Hebrew.

As for the contents of these zoological texts, only a few studies on specific themes are available. Apart from the aforementioned articles on the role of the active intellect in the generation of animals (Freudenthal) and on the controversy between Galen and Aristotle (Bos and Fontaine), I can point to only two such studies: one on the discussions of blood in the Hebrew encyclopedias (Zonta) and the other on the role of the female contribution to generation (Fontaine).[74] There is also a tract in Arabic that has been the object of scholarly research. This text, edited by John N. Mattock, which contains excerpts from Aristotle's *Book of Animals*, has some bearing on the question of which Arabic translations and revisions were available during the Middle Ages.[75] According to its introduction, the author, or rather compiler, is Maimonides. This attribution was rejected by Mattock, but Zonta has recently offered support for it.[76]

CONCLUSION

In general, the medieval study of meteorology and zoology by Jews has attracted less scholarly attention than their engagement with other branches of Aristotelian natural philosophy. Perhaps these two disciplines were considered to be less important for the study of medieval Jewish thought than, for example, *De anima* or *Physics*. I hope I have shown that

[71] For the coverage of this controversy in particular texts, see Gerrit Bos and Resianne Fontaine, "Medico-philosophical Controversies in Nathan b. Yo'el Falaquera's *Sefer Ṣori ha-Guf*," *Jewish Quarterly Review* 110 (1999): 27–60; R. Fontaine, "Aristotle vs. Galen in the Zoological Part of R. Judah ben Salomon's *Midrash ha-Hochmah*," *Proceedings of the Eleventh World Congress of Jewish Studies* Division C (Jerusalem: World Congress of Jewish Studies, 1904), Vol. 2, pp. 41–6; idem, "Did Averroes View Aristotle as an 'Angel of God'?" forthcoming in the Proceedings of the Conference on "La pensée philosophique et scientifique d'Averroès dans son temps" (SIHSPAI; Cordoba, December 9–11, 1998).

[72] Cf. Zonta, "Mineralogy," pp. 279–80.

[73] Hijmans-Tromp, *Mose da Rieti*, pp. 527ff.

[74] See Mauro Zonta, "Sangue e Antropologia: un tema della zoologia di Aristotele nella enciclopedie ebraiche medievali," in Francesco Vattioni, ed., *Atti della VI Settimana Roma, 25–30 novembre 1991 "Sangue e antropologia nel Medioevo"* (Rome: Editore Edizioni Primavera, 1993), pp. 113–39; Resianne Fontaine, "The Facts of Life: The Nature of the Female Contribution to Generation According to Judah ha-Cohen's *Midrash ha-Hokhma* and Contemporary Texts," *Medizinhistorisches Journal* 29/4 (1994): 333–61. See also idem, "Averroes' Commentary on Aristotle's *De Generatione Animalium* and Its Use in Two Thirteenth-Century Hebrew Encyclopedias," in Anna Akasoy and Wim Raven, eds., *Islamic Thought in the Middle Ages*: Studies in Text, Transmission and Translation in Honour of Hans Daiber (Leiden-Boston: Brill, 2008), pp. 489–502, for the following topics: the origin of semen, spontaneous generation, and the cause of straight and curly hair.

[75] J. N. Mattock, ed. and trans., *Maqāla taštamil ʿalā fuṣūl min Kitāb al-ḥayawān li-Arisṭū (Tract Comprising Excerpts from Aristotle's* Book of Animals*) Attributed to Mūsā b. ʿUbaid Allāh al-Qurṭubī al-Isrāʾīlī* (Cambridge: Cambridge Middle East Centre, 1966).

[76] Mauro Zonta, "Maimonides as Zoologist? Some Remarks about a Summary of Aristotle's Zoology Ascribed to Maimonides," in Görge K. Hasselhoff and Otfried Fraisse, eds., *Moses Maimonides (1138–2004): His Religious, Scientific, and Philosophical* Wirkungsgeschichte *in Different Cultural Contexts* (Würzburg: Ergon, 2004), pp. 83–94.

meteorological and zoological texts by medieval Jewish scholars constitute an integral part of the reception of medieval Jewish philosophy and science and thus deserve to be studied thoroughly. From the survey here, it should be clear that, despite the progress that has been made in the study of medieval Hebrew meteorology and zoology in recent years, much remains to be done. Last but certainly not least I should mention a subject that also deserves further exploration – the terminology used in the relevant Hebrew texts. Klatzkin's *ʾOṣar ha-munaḥim* (1929–35) is far from complete with respect to the specific terminology employed in these fields. New terminological information would also contribute to our knowledge of the philosophical and scientific terminology of other disciplines.

13

The Mental Faculties and the Psychology of Sleep and Dreams

Hagar Kahana-Smilansky

In memoriam Amos Funkenstein (1937–1995)

The study of sleep and dreaming has broad implications for the status of the natural sciences among medieval scholars.[1] Whether dreams were thought to arise from natural causes, and thus belong to psychology, or from supernatural causes, and thus belong to metaphysics, reflected a thinker's outlook on science and religion. In what follows I argue that the subject of sleep and dreams was one of the main areas of psychological inquiry and observation in the Middle Ages. Whether it was possible to acquire foreknowledge during sleep, and how, were crucial questions not only for believers in divine providence, but also for students of the mind's functions.

Some Jewish thinkers believed that dreams usually carry no message, but other philosophers, legal scholars, poets, and mystics expressed their belief that their own dreams were veridical. Reports of poetic inspiration or artistic creativity in dreams reflect intense interest in this possibility,[2] taken for granted in much of the literature of the legalistic and kabbalistic "dream queries (*šeʾelot ḥalom*)," in which verbal information is sought through dreams.[3] Even though biblical prophecy was assumed to be bestowed upon special people and to come from supernal sources,[4] many viewed "the right to prophecy" through dreams as egalitarian rather

[1] The following abbreviations are used in the footnotes: *HÜ*, Moritz Steinschneider, *Die Hebräischen Übersetzungen des Mittelalters* (Berlin, 1893; repr. Graz: Akademische Druck- und Verlagsanstalt, 1956); *PN*, *Parva Naturalia*; "Arabic *PN*," an Arabic redaction of *Aristotle's PN* (entitled *Kitāb al-ḥiss waʾl-maḥsūs*) in MS Rampur 1752. References to the *Guide of the Perplexed* are to Moses Maimonides, *The Guide of the Perplexed*, trans. Shlomo Pines (Chicago: University of Chicago Press, 1963).

[2] Moses Ibn Ezra, *Kitāb al-muḥāḍara waʾl-mudhākara*, chapter 7, ed. and Hebrew trans. Abraham S. Halkin, *Sefer ha-ʿIyyunim ve-ha-diyyunim* (Jerusalem: Mekiṣe Nirdamim, 1975), pp. 120–33. Alexander Altmann, ed., "Gersonides' Commentary on Averroes' Epitome of *Parva Naturalia* II, 3," *Proceedings of the American Association for Jewish Research*, Jubilee Volume 46–7 (1979–80): 1–31, line 374f.; see also lines 3–5 and 25–30. Gersonides, *Wars of the Lord*, Treatise II, chapter 4 (Riva di Trento, 1560), f. 17bb.

[3] Moshe Idel, *Nocturnal Kabbalists* (Jerusalem: Carmel, 2006) (in Hebrew). Reuven Margaliot, ed., *Responsa from Heaven by Jacob of Marvege* (Jerusalem: Mosad ha-Rav Kook, 1957), proem (in Hebrew). Yisrael M. Ta-Shma, "Responsa from Heaven: The Collection and Additions," *Tarbiz* 57 (1988): 51–66 (in Hebrew).

[4] See Howard Kreisel, *Prophecy: A History of an Idea in Medieval Jewish Philosophy* (Dordrecht: Kluwer, 2001). Colette Sirat, *Les théories des visions surnaturelles dans la pensée juive du moyen âge* (Leiden: Brill, 1969).

I am grateful to Joel L. Kraemer, Ruth Glasner, and Gad Freudenthal for comments on an earlier draft of this chapter; to Hans Daiber and Rotraud Hansberger for providing me with a copy of the Arabic *Parva Naturalia* found in MS Rampur 1752; to Rotraud Hansberger, Benjamin Abrahamov, and Wendy L. Anderson for their unpublished articles; and to the staff of the Institute of Microfilmed Hebrew Manuscripts at the National Library in Jerusalem for their assistance.

than elitist: The science of the soul could explain predictive dreams as a natural psychological phenomenon, making them the common property of all human beings, regardless of religion, education, or physical constitution.[5]

Dreams figure prominently in Scripture and the rabbinic writings, but these texts played a limited role in determining Jewish scholars' opinions on sleep and dreams. The Babylonian Talmud, especially the section on dreams in the tractate *Berakhot*, offers divergent views on their nature. Like the Talmud in general, this collection of opinions is compiled from multiple sources deriving from different generations, schools, and editors. The views presented range from affirming the prophetic nature of all dreams to utter skepticism.[6] Medieval Jewish scholars seldom incline to the skeptical side of this talmudic spectrum. Even Maimonides (1137/8–1204), who designates the dream as an "aborted fruit of prophecy," makes statements to the contrary.[7] Although medieval Jewish thinkers refer to the rabbinic discussions, their main inspiration came from the Islamic synthesis of ancient Greek philosophy and medicine. We should not expect Jewish thinkers of a scientific bent to have recourse to talmudic views on dreams any more than they did to talmudic astronomy or medicine, where they preferred to rely on Ptolemy and Galen.

Here I review the psychological theory of dreaming that was developed by medieval Islamic philosophers, the reception of this theory by Jewish scholars, medical views of sleep and dreaming in relation to pathology, and the classification of sleep, dreams, and psychology in medieval Jewish scientific encyclopedias. Three related themes that could not be addressed in detail – theoretical dream interpretation, psychological knowledge in the exegetical literature, and the astral theories of dreams – are briefly surveyed in a later section.

DREAM PSYCHOLOGY IN ISLAMIC SOURCES

Given that most of the treatises mentioned in this section were studied by Jewish writers, in Arabic versions or in Hebrew translation, the present overview provides a basis for the next section, the reception of these developments by Jewish scholars.[8] The present section comprises (a) Arabic-Islamic sources for the synthesis of the psychologies of Aristotle and Galen, (b) an outline of the philosophical contributions to the psychology of dreaming in Islam, and (c) problems.

Sources

In the Islamic philosophical and medical literature prevailed the synthesis of Aristotle's and Galen's psychologies, which applied the Aristotelian distinctions of the mental faculties to the brain. The various mental functions, localized in the ventricles of the brain, were thought to operate in virtue of the psychic spirit contained in this organ. The quality of this spirit was believed to determine the capacity of mental performance. This paradigm had already been established in Islam by the last third of the ninth century. The physicians – Ḥunayn Ibn Isḥāq (800–73),[9] Quṣṭā Ibn Lūqā (ca. 820–912) in the *Epistle on the Difference between the Soul and*

5 Sirat, *Les théories*, p. 162. Moshe Idel, "'Hitbodedut' as Concentration in Ecstatic Kabbalah," *Studies in Ecstatic Kabbalah* (Jerusalem: Academon, 1990), on pp. 126–7 (in Hebrew). Cf. *Avicenna's* De Anima *(Arabic Text): Being the Psychological Part of Kitāb al-šifāʾ*, ed. Fazlur Rahman (London: Oxford University Press, 1959), p. 174.

6 BT *Berakhot* 55–7.

7 *Guide of the Perplexed* Part II, chapter 36 (p. 370); see my subsection on Maimonides in the current text.

8 I am indebted to the classic 1935 study of this subject by Harry Austryn Wolfson (see next note), which requires reconsideration in view of new research.

9 *The Book of the Ten Treatises on the Eye Ascribed to Ḥunayn Ibn Isḥāq* (809–877 A.D.), Arabic ed. with English trans. Max Meyerhof (Cairo: Government Press, 1928), pp. 17/86. Also see Harry A. Wolfson, "The Internal Senses in Latin, Arabic and Hebrew Philosophic Texts," in Isadore Twersky and George H. Williams, eds., *Studies in*

the Spirit,[10] Abū Bakr al-Rāzī (854–925),[11] and the North African Ibn al-Jazzār (d. 979/80), in the *Epistle on Forgetfulness*[12] – quote in Galen's name his ideas on the localization of the mental functions: Sense perception and imagination operate in the two frontal ventricles of the brain, cogitation and judgment in the middle ventricle, and memory in the back one.

This tradition is apparently based on Galen's treatises *The Usefulness of the Parts, Anatomical Procedures,* and *The Opinions of Hippocrates and Plato,*[13] but possibly on another treatise as well. The recently discovered Arabic translation by Ḥunayn Ibn Isḥāq of Galen's *On My Own Books* (*De libris propriis*) brought to light previously unknown titles of books that Galen says he had written. One of them is a treatise explaining "the faculties of the rational soul, which are imagination, intellect, and memory." This work, which is not known to be extant,[14] may have localized the mental processes according to Galen's usual method and may have been known to physicians in the ninth century. Another source of Galenic psychology, made available in Arabic by Ḥunayn Ibn Isḥāq in the ninth century, is Nemesius's *On the Nature of Man* (*De natura hominis,* ca. 390–400).[15] There is little evidence for the persistence of the experimental attitude that led Galen to his discoveries on neural and cerebral anatomy and physiology, but the Galenic brain model was refined and expanded in Islamic accounts of the intercommunication of the mental faculties.

The close comparison between mental activity in sleep and waking goes back to Aristotle. He postulated that dreams are produced by remnant sense perceptions that continue to flow in the blood vessels toward the heart, the mental center (*De somno* 455b8–13; *De insomniis* 458b3–9), while perception itself and intellectual judgment are suspended (*De insomniis* 458b10ff.). An Arabic redaction of Aristotle's *Parva Naturalia* (henceforth *PN*) was recently discovered in MS 1752 in Rampur, India. Rotraud Hansberger, who edited this text, was able to prove that it was employed by early eleventh-century writers, including Avicenna, and that a somewhat different version was known in the tenth century. According to her, the Arabic treatise is not a translation of Aristotle's *PN*: "More than half of the text is constituted by more or less lengthy passages that have no equivalent in the Greek text."[16] With respect to dreams and divination, "only traces of the Greek *De insomniis* and *De divinatione per somnum* can be found in the Arabic text"; "the Arabic version takes a view on veridical dreams quite contrary to that of the Greek *De divinatione*. . . . [It] focuses on two main points: the creation

the History of Philosophy and Religion (Cambridge, MA: Harvard University Press, 1973), Vol. 1, pp. 250–314, on p. 254 n. 21; originally published in *Harvard Theological Review* 28 (1935): 69–133.

[10] *Kitāb/Risālah fī al-farq bayna al-nafs wa'l-rūḥ,* ed. Louis Cheicho, *Al-Machriq* 14 (1911): 94–109; repr. in *Qusṭā Ibn Lūqā, Texts and Studies,* ed. Fuat Sezgin (Frankfurt: Institute for the History of Arabic-Islamic Science, 1996), pp. 153–66, on pp. 156–9.

[11] Al-Razi, *Kitāb al-manṣūrī fī al-ṭibb,* ed. Hazim al-Bakri al-Siddiqi (Kuwait: Arabic Cultural and Educational Organization, 1984), pp. 57–8.

[12] *Ibn al-Jazzār, On Forgetfulness and Its Treatment,* ed. and trans. Gerrit Bos, Wellcome Asian Series (London: The Royal Asiatic Society, 1995), pp. 30–1, 38.

[13] Ibn Lūqā names these three works as his sources (*Soul and Spirit,* introduction). Meyerhof (*Ten Treatises on the Eye,* p. 17) and Bos (*Ibn al-Jazzār,* pp. 18–19) trace it to Galen's *Usefulness of the Parts* I.VIII.10–14. Compare Galen, *On the Usefulness of the Parts of the Body,* English trans. Margaret T. May (Ithaca: Cornell University Press, 1968), Vol. 2, 412–17 (VIII.10–12).

[14] Véronique Boudon, "Galen *On My Own Books*: New Material from Meshed, Rida, Ṭibb. 5223," in Vivian Nutton, ed., *The Unknown Galen* (London: Institute of Classical Studies, University of London, 2002), pp. 9–18, on p. 18.

[15] The Arabic translation was edited by Ursula Weisser, *Buch über das Geheimnis der Schöpfung und der Darstellung der Natur von Pseudo-Apollonios von Tyana* (Berlin: de Gruyter, 1979), Appendix II, pp. 537–631. A Greek-Latin translation was made in Salerno around 1058. For the Latin translations, see C. D. O'Malley, "Nemesius," *Dictionary of Scientific Biography* (New York: Scribner's, 1974), Vol. 10, pp. 20–1.

[16] Rotraud Hansberger, "How Aristotle Came to Believe in God-Given Dreams: The Arabic Version of *De divinatione per somnum,*" in Louise Marlow, ed., *Dreaming across Boundaries: The Interpretation of Dreams in Islamic Lands* (Boston, MA: Ilex Foundation and Cambridge, MA: Harvard University Press, 2008), pp. 50–75, on p. 52.

of such dreams by God, and the processes that are taking place within the human soul when having veridical (or non-veridical) dreams."[17]

This Arabic treatise, too, reconciles the physiological systems of Aristotle and Galen: the heart is the cause of sleep, through its physical functions (with Aristotle), but Galen's brain-centered psychology plays a role in sleep and waking (f. 37b, 1–9), and the nerves issuing from the brain are the instruments of movement and sensation (f. 38a, 16–18). Averroes' *Epitome of the PN* (*Talkhīṣ kitāb al-ḥiss wa'l-maḥsūs*), completed in 1170, probably used a very similar version of the Arabic *PN*.

Philosophical Contributions to Psychology in Islam

No medieval thinker doubted that sense perception is largely suspended during sleep; most of them also invoked Aristotle's physiological explanation of sleep (*De somno*, III, 456a30–b28), though they often replaced his concepts (for example, "vital spirit" for "innate heat"). Other parts of Aristotle's theory also went through considerable changes. The early Islamic philosopher al-Kindi, who adhered to the Galenic brain-centered psychology, defines the imagination much in the way of the Greek commentators on *De anima*: The imagination takes over where sense perception ends. Its functions are to preserve images, to separate and combine them in various ways, and to mediate between perception and thinking. Al-Kindi contradicts Aristotle in assuming continuity between dreaming and thought: Modes of dreaming can be reduced to intellectual activity on its diverse levels, which means that the latter are perpetuated during sleep, for, he states in a Plotinian vein, "the soul never sleeps."[18]

Whereas the history of the influence of al-Kindi's treatise on Jewish writers is not known, the reformulation of the theory of mental functions by al-Farabi (d. 950) was certainly used by them. Particularly relevant to the theory of dreams are al-Farabi's concept of the "faculty of impulse" (*al-quwwa al-nuzūʿīya, nuzūʿ*) and the creative function of the imagination, "imitation." In al-Farabi's hierarchy of the faculties within the soul, "impulse" appears at first sight to belong to the lower, "animal" functions; it is responsible for the basic drive in animals either toward, or away from, an external object. In fact, however, it determines the direction not only of passions and movement but also of the higher functions of choice, volition, imagination, memory, and thought. It is thus an all-pervasive faculty of the mind.[19] The influence of the faculty of impulse on dreaming is usually indirect; motivations that it induced during wakefulness are "imitated" by the imagination in the dreams. These images produce "readiness" for action in the limbs. Sometimes these images, which encapsulate the impulses, are strong enough to drive sleepers out of bed and behave as if they were reacting to external stimuli.[20]

The "imitative" function of the imagination provides the mind with a common language of representation: Previously perceived experiences are stored in the imagination

[17] Hansberger, "Aristotle and God-Given Dreams," pp. 52–4. Her study confirms the basic assumption of Shlomo Pines, "The Arabic Recension of the *Parva Naturalia* and the Philosophical Doctrine concerning Veridical Dreams According to *al-Risāla al-Manāmiyya* and Other Sources," *Israel Oriental Studies* 4 (1974): 104–53, on pp. 112ff.

[18] "On the Essence of Sleep and Dreams," in Yaʿqub b. Isḥāq al-Kindi, *Philosophical Epistles*, ed. M. ʿA. Abu Rida (Cairo: Dar al-Fikr al- ʿArabi, 1950–1953), Vol. 1, pp. 293–311, on p. 294.

[19] Al-Farabi, *The Opinions of the Inhabitants of the Virtuous City*: in *Alfarabi's philosophische Abhandlungen*, Arabic ed. Friedrich Dieterici (Leiden: Brill, 1964), pp. 49–50 (originally published 1895); in *Al-Farabi on the Perfect State*, Arabic-English ed. Richard Walzer (Oxford: Clarendon Press, 1986), pp. 214–16; H. Kahana-Smilansky, "The Science of Dreams: Dream Theory in Islam from the Ninth to the Eleventh Centuries," Ph.D. dissertation, Tel Aviv University, 2002, pp. 118–21, 126–7 (Heb.).

[20] Al-Farabi, *Virtuous City*, ed. Dieterici, pp. 49–50; ed. Walzer, pp. 216–18.

as images that the imagination can use to represent ("imitate") the internal sensations, emotions, memories, and intellectual and supernal intelligible notions, particularly in dreams. These images are qualified by the dreamer's language and literary and material culture, thus dream symbolism is relative and conditioned by each society.[21] Al-Farabi's notions are subsequently found in many philosophical works such as Avicenna's *De anima* (part of the *Kitāb al-šifāʾ*, ca. 1020–7), works of al-Ghazali (1058–1111), and Averroes' *Epitome of the PN*.

Tenth-century Islamic philosophers accepted, against Aristotle's opinion, al-Kindi's view that rational cogitation continues during sleep. Avicenna, in *The Canon of Medicine*, explains that dreaming belongs in the chapter of the organizing (*siyāsīya*) mental operations: cogitation, discrimination, memory, and imagination. According to Avicenna, these faculties operate in dreaming, with an additional faculty that is aware of the supernatural. Sense perception, purposeful movement, and voluntary control of the imagination are inactive during sleep.[22] Islamic philosophers generally accepted that the imagination can function as a tool of rational activity, but in sleep it is left uncontrolled and freely creates images within itself. According to al-Farabi, the imagination produces in sleep an "infinite number of combinations" out of its stored images.[23] The creative imagination was praised even more by the Brethren of Purity and by Avicenna: It is the most "marvelous" and unlimited activity of all the mental functions. During sleep it "returns to its own real nature"; free from the moral and purposeful control of judgment, it reaches the wildest, as well as most truthful, perceptions.[24]

Problems

An intriguing and apparently underresearched issue is the status that Islamic and Jewish philosophers assigned to the possibility of attaining complete ("perfect") knowledge,[25] which enables one to make predictions, other than through prophetic revelation. There are two main psychological explanations of prediction: one by an intuitive power, the other through the integration of scattered information. Both provide a naturalistic explanation that would compete with the theological account of attaining perfect knowledge.

Al-Kindi contrasted prophetic knowledge with the acquisition of knowledge through the study of philosophy: Prophetic knowledge is effortless, instantaneous, and "perfect," whereas philosophical science is laborious, time consuming, and never brought to perfection.[26] Mantic knowledge obtained through dreams was, however, equated to prognostication in certain scientific endeavors such as medicine (diagnosis and prognosis), astronomy, astrology, and weather forecasting. Two positions are on record: One apparently implies that

[21] Hans Daiber, "Prophetie und Ethik bei Farabi," in Charles Wenin, ed., *L'homme et son univers au moyen âge* (Louvain: Institut supérieur de philosophie, 1986), pp. 729–53.

[22] Avicenna, *Canon of Medicine* III.I.I.5 (Cairo: Bulaq, 1877), Vol. 2, pp. 7, 9 (Arab.); Kahana-Smilansky, "Science of Dreams," pp. 134–58.

[23] Al-Farabi, *Virtuous City*, ed. Dieterici, p. 43; ed. Walzer, p. 196: *tarkībāt kathīra bi-lā nihāya*.

[24] *The Epistles of the Brethren of Purity*, ed. Khayr al-Din al-Zarkali (Cairo, 1928), Vol. 3, pp. 389f.; Avicenna, *Risālat al-manāmīya*, edition of the first thirteen chapters by M. A. Muʿid Khan, "A Unique Treatise on the Interpretation of Dreams by Ibn Sina," in V. Curtois, ed., *Avicenna Commemoration Volume* (Calcutta: The Iran Society, 1956), pp. 255–307, on pp. 278–9 and 282ff.

[25] For our purpose, suffice it to say that prophecy is the model of "perfect" knowledge.

[26] Al-Kindi, "The Quantity of Aristotle's Books and the Necessary [Reading] for the Acquisition of Philosophy," in Abu Rida, ed., *Philosophical Epistles*, Vol. 1, pp. 372–3; Peter Adamson, "Al-Kindi and the Reception of Greek Philosophy," in Peter Adamson and Richard C. Taylor, eds., *The Cambridge Companion to Arabic Philosophy* (Cambridge, MA: Cambridge University Press, 2005), pp. 32–51, on pp. 46–7.

prognostication through either dreams or the sciences does not involve divine inspiration,[27] the other, that both may be divinely inspired.[28] However, both positions entail that persons engaged in scientific inquiry are not inferior to the prophets in knowledge and their capacity to make predictions.

In a well-known exposition of Avicenna's concept of intuition (*ḥads*), Dimitri Gutas showed that this concept applies both to logical inference and to dreaming.[29] Accounts of the other way of attaining knowledge, by integrating scattered information during sleep, have yet to be studied in depth. I wish to emphasize the question of how the semiprophetic prediction reached by an intuitive power is related to the prediction that is reached through integrated information. Presumably, one ("superior") mental faculty integrates the information reached through various mental faculties. Can we surmise that it is the same mental faculty that is able to "prophetically" intuit the missing knowledge and bring it to perfection? Or are these two explanations for the access to "perfect" knowledge – by intuition or by integration of scattered information – posited as unrelated mental processes that happen to produce the same outcome?

Here is a brief survey of pronouncements on this subject in Arabic philosophy. According to the Brethren of Purity (ca. 950), the knowledge acquired purely through integration by the mental faculties is equivalent to that acquired through divine inspiration.[30] A little earlier, al-Farabi attributed foreknowledge (*kahānāt*) and predictive dreams (*ru'yā ṣādiqa*) to the combined activity of two mental faculties, namely imagination and the intellect (in both its practical and theoretical aspects), when they are invigorated by the Active Intellect.[31]

The Arabic *PN* explains this as follows: If a man is able to "unify" the activity of the imagination, cogitation, and memory, he "sees what is *in potentia* as one sees what is *in actu*"; he then perceives things that are "more noble" than those perceived by each faculty separately.[32] Averroes repeats this doctrine in his *Epitome of the PN*, adding the *sensus communis* to the faculties to be unified. This so-called unification intensifies the perception of "spiritual forms" in ecstatic states and dreams.[33]

Avicenna's theory of *wahm* (commonly translated as "the estimative faculty") is related to the view that foreknowledge follows from the integration of information. *Wahm* has been thoroughly analyzed, particularly from the logical aspects, by Deborah Black,[34] and its place in Avicenna's psychology, as well as its theological aspects, were discussed by Robert E. Hall.[35] The functions of *wahm* are notoriously difficult to reconcile with each other: It is prone to

[27] Qusṭā ibn Lūqā, *Une correspondance Islamo-Chrétienne entre Ibn al-Munajjim, Ḥunayn Ibn Isḥāq et Qusṭā Ibn Lūqā*, ed. and French trans. Khalil Samir and Paul Nwyia, *Patrologia Orientalis* (Turnhout: Brepols, 1981), Vol. 40, Fasc. 4, No. 185, pp. 592–685, on pp. 632–8.

[28] Kahana-Smilansky, "Science of Dreams," pp. 142–7, 145 n. 154, 156–8.

[29] Dimitri Gutas, *Avicenna and the Aristotelian Tradition* (Leiden: Brill, 1988), pp. 27f., 161–77.

[30] *Epistles of the Brethren of Purity*, Vol. 3, pp. 388–94.

[31] Farabi, *Virtuous City*, ed. Dieterici, chapter 24, p. 50; ed. Walzer, chapter 14, pp. 218–20; Herbert A. Davidson, *Alfarabi, Avicenna, and Averroes, on Intellect* (New York: Oxford University Press, 1992), pp. 50–61.

[32] MS Rampur 1752, ff. 22a14–23b22.

[33] This work is cited in the following text as Averroes, *Epitome of the PN*. I use the Arabic edition: *Averrois Cordubensis Compendia Libri Aristotelis qui Parva Naturalia Vocantur*, ed. Harry Blumberg (Cambridge, MA: Harvard University Press, 1972). The Hebrew text is *Averrois Cordubensis Compendia Librorum Aristotelis qui Parva Naturalia Vocantur, textum Hebraicum*, ed. Harry Blumberg (Cambridge, MA: Harvard University Press, 1954). This passage appears on pp. 45ff. (in the Arabic edition) and pp. 30ff. (in the Hebrew edition).

[34] Deborah L. Black, "Estimation (*Wahm*) in Avicenna: The Logical and Psychological Dimensions," *Dialogue* 32 (1993): 219–58.

[35] Robert E. Hall, "The '*Wahm*' in Ibn Sina's Psychology," in Maria Cândida Pacheco and José Francisco Meirinhos, eds., *Intellect et imagination dans la philosophie médiévale* (Turnhout: Brepols, 2006), Vol. 1, pp. 533–49.

error and delusion,[36] yet it accounts for reliable, inborn instincts (or natural inspiration, *ilhām*) in animals and humans.[37] The primary function of *wahm* is to unite "form with intention and form with form," and its place is on the borderline between the corporeal and incorporeal realms, or between imagination and intellect.[38]

In *Fuṣūṣ al-ḥikam* (Chapters of Wisdom, identical to *Risalat al-firdaws*), a treatise by Avicenna or one of his disciples,[39] there is a similar theory on the integration of information. This integration is implemented by a faculty located between the internal and external senses; it takes place in both sleep and waking, whether the forms and information to be integrated originate from without or from within. In sleep, some information about "the invisible" (*al-ghayb*), from the supernatural domain, may also appear in this integrating faculty.[40] It appears, then, that the faculty sensitive to supernatural knowledge is also the one responsible for the prosaic integration of knowledge. However, this text and its impact require further study, as does this whole question.

THE RECEPTION OF DREAM PSYCHOLOGY BY JEWISH SCHOLARS

This section surveys the psychological literature received by Jewish thinkers, mainly from Arabic sources. Research into the availability of Latin works on the psychology of dreams is still in a preliminary state. Our knowledge of the Jewish sources and the history of learning in this field are incomplete, but it seems that medieval Jewish thinkers were much less interested in dream psychology than Islamic scholars were. No Jewish author is known to have dedicated a book to the subject, or to dream interpretation, before Solomon Almoli in the sixteenth century. Some of the received doctrines were, however, further elaborated in Jewish philosophy. I will follow a few lines of these developments in Pre-Maimonidean writers, in Maimonides, and in later writers who wrote in Hebrew.

Arabic Texts Used by Medieval Jewish Scholars

The Arabic works that took over Galen's model of the mental functions in the brain and that were used in Arabic by Jewish philosophers[41] included Ibn Lūqā's *Difference between the Soul and Spirit*.[42] Gershom ben Solomon used a Hebrew translation of it in his encyclopedia *Šaʿar ha-šamayim* (c. 1275–85).[43] Ibn al-Jazzār's *On Forgetfulness* was translated into Hebrew

[36] Black, "Estimation," pp. 229ff. Helmut Gaetje, "Philosophische Traumlehren im Islam," *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 109 (1959): 258–85, on pp. 267–70. Hall ("Wahm," 538ff.) explains some inconsistencies as different stages in the development of this idea.

[37] Black, "Estimation," p. 219. Hall, "Wahm," p. 537.

[38] Cf. Hall, "Wahm," pp. 533, 542. Black, "Estimation," pp. 183–5, 218, 268. Fazlur Rahman, *Avicenna's Psychology: An English Translation of Kitāb al-Najāt, Book II, Chapter VI* (London: Oxford University Press, 1952), pp. 168–9. Gaetje, "Traumlehren," pp. 267ff.

[39] The *Fuṣūṣ al-ḥikam* (not to be confused with Ibn al-`Arabi's composition of the same title) was printed in *Alfarabi's philosophische Abhandlungen* (ed. Dieterici, pp. 66–83). Wolfson ("Internal Senses") and Gaetje ("Traumlehren") relied on this work in evaluating Farabi's psychology, but Shlomo Pines shows it is spurious in "Ibn Sina et l'auteur de la Risālat al-Fusūs fī al-Hikma," *Revue des Etudes Islamiques* 19 (1951): 121–4.

[40] "Fuṣūṣ," *Alfarabi's philosophische Abhandlungen*, on pp. 73–6. Gaetje, "Traumlehren," pp. 266–7. The prophetic and occult aspects of *wahm* are summarized by Hall, "Wahm," pp. 543ff. See also Wolfson, "Internal Senses," p. 274 (*pronoia*); Rahman, *Avicenna's Psychology*, pp. 77–83.

[41] Namely, Maimonides and Judah b. Nissim Ibn Malka: see *HÜ*, section 157, p. 289; Georges Vajda, *Juda ben Nissim, philosophe juif marocain* (Paris: Maisonneuve et Larose, 1954), pp. 122–5.

[42] See n. 10.

[43] Henry Gross, "Zur Geschichte der Juden in Arles," *Monatsschrift für Geschichte und Wissenschaft des Judentums* 28/5 (1879): 228–38, on p. 232. *HÜ*, section 157, pp. 288–9. For Gershom's dependence on Hebrew sources,

twice during the last third of the thirteenth century.[44] In contrast, Nemesius's *On the Nature of Man* is not known to have been translated into Hebrew or used by Jewish writers in either its Arabic or Latin versions.[45]

The psychological theory of the Jewish Neoplatonist Isaac ben Solomon Israeli of Kairouan (ca. 855–ca. 932) was studied by Harry A. Wolfson[46] and by Samuel M. Stern and Alexander Altmann,[47] but their findings should be reviewed in light of the recently discovered Arabic *PN*. Hansberger shows close similarity between passages in the Arabic [Pseudo-] Aristotelian *PN* and Israeli's *Book on the Elements* (lost in the original Arabic but preserved in Hebrew and Latin translations).[48] The Arabic *PN* was not translated into Hebrew, except for a few excerpts translated by Zeraḥiah ben Isaac ben She᾽altiel Ḥen of Barcelona in his *Commentary* on Maimonides' *Guide*, written after he moved to Rome (at the end of the 1280s).[49] A version of the Arabic *PN* was known to Jewish scholars from Spain, such as Joseph Ibn Ṣaddiq (d. 1149)[50] and Maimonides.[51] Moses Ibn Ezra (1060?–1139?) quotes it in his *Kitāb al-muḥāḍara wa'l-mudhākara*.[52] Joseph Ibn Waqqar of Toledo (d. ca. 1360), in the *Conciliation between Philosophy and Religious Law*, says that he counts the faculties of the soul according to the second treatise of the *PN*.[53] Samuel Ibn Tibbon, in his commentary on Ecclesiastes (7:19), states that Aristotle's *PN* was his source for the distinctions among three faculties of memory. These may have been derived from the various models and terminology used in the discussions of memory and recollection in the Arabic *PN*.[54]

Possibly related to this tradition is a *Book of Sleep* (*Sefer ha-Šenah*) that Naḥmanides (1195?–1270?) quotes in his commentary on Genesis (41:7) with regard to the validity of repeated dreams. Attention has been drawn to this reference as well as to its citation in Jacob ben Asher's commentary on the Torah. However, the assumption that this *Book of Sleep* was Melguiri's *Aristotle on Sleep and Wakefulness*[55] is untenable, because none of these passages is found in the latter, nor even the very subject of the validity of repeated dreams. If Naḥmanides had access to a *Book of Sleep* in either Hebrew or Arabic, it is not known to be extant and remains unidentified. The validity of repeated dreams is affirmed, in passing, in the second

see Mauro Zonta, "Mineralogy, Botany and Zoology in Medieval Hebrew Encyclopedias," *Arabic Sciences and Philosophy* 6 (1996): 263–315, on pp. 277–8.

44 Bos, *Ibn al-Jazzār*, pp. 5–9.

45 See n. 15.

46 Harry A. Wolfson, "Isaac Israeli on the Internal Senses," *Jewish Studies in Memory of G. A. Kohut* (New York, 1935), pp. 583–98. "Notes on Isaac Israeli's Internal Senses," *Jewish Quarterly Review* n.s. 51 (1961): 275–87. Both are reprinted in Twersky and Williams, eds., *Studies in the History of Philosophy and Religion*, Vol. 1, pp. 315–30 and 331–43, respectively.

47 Alexander Altmann and S. M. Stern, eds., *Isaac Israeli* (Oxford: Oxford University Press, 1958).

48 Hansberger, "Aristotle and God-Given Dreams," pp. 72–3. Cf. Altmann and Stern, *Isaac Israeli*, pp. 134–40.

49 Aviezer Ravitzky, "Hebrew Quotations from the Lost Arabic Recension of *Parva Naturalia*," *Jerusalem Studies in Arabic and Islam* 3 (1981/2): 191–202, on pp. 194–7.

50 *HÜ*, section 74, p. 153 nn. 336, 338; David Kaufmann, "Die Sinne: Beiträge zur Geschichte der Physiologie und Psychologie im Mittelalter," *Jahresbericht der Landes-Rabbbinerschule* (London: Gregg International Publications, 1972), p. 55 (originally published in Budapest, 1884).

51 Gerrit Bos, *Maimonides, On Asthma* (Provo, UT: Brigham Young University Press, 2001), p. 91 nn. 25–6, p. 137.

52 Hansberger, "Aristotle and God-Given Dreams," p. 56. Cf. Halkin, ed. and trans., *ʿIyyunim*, p. 120.

53 Georges Vajda, "La conciliation de la philosophie et de la loi religieuse (*Al-maqāla al-jāmiʿa bayna al-falsafa wa'l-sharīʿa*) de Joseph b. Abraham Ibn Waqār," *Sefarad* 9 (1949): 311–50, on pp. 315–16.

54 James T. Robinson, "Samuel Ibn Tibbon's Commentary on Ecclesiastes," Ph.D. dissertation, Harvard University, 2002, Vol. 2, p. 757, lines 5813f. Cf. Rotraud E. Hansberger, "The Transmission of Aristotle's *Parva Naturalia* in Arabic," Ph.D. dissertation, University of Oxford, 2006, Vol. 1, pp. 23–9, 95ff., 119ff.

55 Samuel Ashkenazi, "ʿOlalot," *ʿAley Sefer* 17 (1993): 125–31, on pp. 128–9 (in Hebrew).

chapter of the Arabic *PN* and in Averroes' *Epitome of the PN*.[56] Naḥmanides read Arabic,[57] and there is some evidence to suggest that he was acquainted with the Arabic *PN*, but the matter requires further investigation.

Isaac Israeli's *Book of the Elements* and Moses Ibn Ezra's *Muḥāḍara* follow the tradition of the Arabic *PN* or its immediate sources. These two Jewish scholars assign a relatively significant role to cogitation in dreams (like al-Kindi), but also to the *sensus communis*. Israeli places the *sensus communis* at the focus of processing knowledge and mediating divine inspiration: In ordinary perception, the *sensus communis* mediates the "forms" from corporeality to incorporeality (from the corporeal sense of sight to the imaginative faculty). The *sensus communis* is also essential in the process through which the Universal Intellect imparts, by emanation, spiritual forms to the human soul. These "spiritual forms" are imparted in a state "intermediate between corporeality and spirituality, in order that they may be more readily impressed on the *sensus communis*."[58] In short, the *sensus communis* receives divine "spiritual" knowledge. This function is associated with its role in ordinary perception, which is to mediate between sense perception and imagination.

Moses Ibn Ezra used Israeli's *Book of the Elements* in addition to the Arabic *PN*.[59] He evaluates the possibility that poetic inspiration is received through dreams and offers a twofold explanation: Generally, poetic inspiration results from the poet's desire to create and occurs when the intensity of his cogitation, in sleep, activates the *sensus communis*. Unusual, unexpected creative inspiration may also come in sleep, without any effort on the poet's part, when the poet's rational soul receives an emanation from the divine world, which it passes on to his faculty of cogitation.[60]

Al-Farabi's psychology reached Jewish philosophy through the *Opinions of the Virtuous City*, the *Chapters of the Politician* (both of them in Arabic), the translation of the *Politics* (*al-Siyāsa al-madanīya*) into Hebrew (*Hatḥalot ha-nimṣa'ot*) by Moses Ibn Tibbon (1248), and other works.[61] Gad Freudenthal and Mauro Zonta have recently produced an extensive survey on the role of Avicenna's thought in stimulating Jewish philosophy. It is well known that Avicenna's *De anima*, the *Canon*, and other works were not available in Hebrew before the thirteenth century.[62] Nevertheless, some parts of his psychology are noticeable in the writings of earlier Jewish scholars, which are mentioned in the following discussion.

56 MS Rampur 1752, ff. 41b23–42a2; Hansberger, "The Transmission of Aristotle's *Parva Naturalia*," Vol. 2, pp. 113–14. Cf. Averroes, *Epitome of the PN*, ed. Blumberg, p. 86 (Arabic edition) and pp. 55–6 (Hebrew edition).

57 Raphael Jospe, "Naḥmanides and Arabic," *Tarbiz* 57 (1987): 67–94 (in Hebrew).

58 Isaac Israeli, *Das Buch über die Elemente: ein Beitrag zur jüdischen Religionsphilosophie des Mittelalters von Isaak b. Salomon Israeli,* ed. Salomon Fried (Frankfurt: J. Kauffmann, 1900), Hebrew text pp. 53, 55. Wolfson, "Israeli on the Senses," p. 583 (repr. p. 315). Altmann and Stern, *Isaac Israeli*, pp. 135, 140–3.

59 Altmann and Stern, *Isaac Israeli*, pp. xii–xiv. Georges Vajda, "Le commentaire kairoanaise sur *Le Livre de la Création*," *Revue des études juives* 13 (n.s. 113) (1954): 37–61, on p. 40.

60 Halkin, ed. and trans., *ʿIyyunim*, p. 132.

61 Joel L. Kraemer, "Alfarabi's *Opinions of the Virtuous City* and Maimonides' *Foundation of the Law*," in Joshua Blau et al., eds., *Studia Orientalia Memoriae D. H. Baneth Dedicata* (Jerusalem: Magnes Press, 1979), pp. 107–53. Jeffrey Macy, "Prophecy in al-Farabi and Maimonides: The Imaginative and Rational Faculties," in Shlomo Pines and Yirmiyahu Yovel, eds., *Maimonides and Philosophy* (Dordrecht: Kluwer, 1986), pp. 185–201, on pp. 192–5. Herbert A. Davidson, "Maimonides' *Eight Chapters* and Alfarabi's *Fusul al-Madani*," *Proceedings of the American Academy for Jewish Research* 30 (1969): 33–50. Farabi's *Fuṣūl muntazaʿa* was one of the sources of Maimonides' *Eight Chapters*; see W. Z. Harvey, "Three Theories of the Imagination in 12th-Century Jewish Philosophy," in Pacheco and Meirinhos, *Intellect et imagination dans la philosophie médiévale*, Vol. 1, pp. 287–302, on p. 297.

62 Gad Freudenthal and Mauro Zonta, "Avicenna amongst Medieval Jews: The Reception of Avicenna's Philosophical, Scientific and Medical Writings in Jewish Cultures, East and West," in Peter Adamson, ed., *Interpreting Avicenna*: Critical Essays (Cambridge University Press, forthcoming in 2011). Steven Harvey's earlier views on this question were modified in his "Islamic Philosophy and Jewish Philosophy," *Cambridge Companion to Arabic Philosophy* (Cambridge, MA: Cambridge University Press, 2005), p. 353.

Maimonides

Maimonides was heir to the Arabic philosophical tradition, and through his writings it reached a wide Jewish readership, both in Arabic and in Hebrew. Maimonides accepts that the imagination preserves, divides, and combines images, that "imitation" is its "greatest and most noble function,"[63] and that the true nature of the imagination becomes apparent in sleep.[64] He does not, however, share his Islamic predecessors' approval, let alone praise, of its creative freedom; on the contrary, the creative imagination is misleading because it forms representations of nonexistent entities.[65] Maimonides' scattered teachings about imagination and dreams, in various contexts, and his contradictory statements[66] pose well-known difficulties. Here I summarize a few points concerning his views, which were extensively studied in relation to prophecy and political leadership.[67]

A significant difference between Maimonides and his predecessors is that for him imagination is a corporeal function that depends on the bodily temperament (which itself depends on biological and genetic factors) and is associated with material inclinations.[68] In contrast, for al-Farabi, Isaac Israeli, and other tenth-century philosophers, imagination is incorporeal (*nafsānīya*, "spiritual").[69] The relations between imagination and intellect in Maimonides' *Guide* are complex; as distinct from "representation" (*taṣawwur*), which is involved in conceptualization, imagination is opposed to thought.[70] Maimonides emphasizes that a perfect imagination allows the prophet to experience prophetic revelation not only intellectually but also sensually.[71] However, even when speaking positively of imagination as a prerequisite

[63] Maimonides, *Guide* Part II, chapter 36 (p. 370).

[64] *Guide* Part II, chapter 36 (p. 370); *Pirqei Mošeh bi-refu'ah* I.34. Sense perception is incapacitated during sleep; see *Guide* Part II, chapter 36 (p. 370).

[65] *Guide* Part I, chapter 74 (p. 220); Part I, chapter 73 (pp. 206–7, 209–10); Part II, chapter 47 (p. 409); Part III, chapter 51 (p. 620); Wendy L. Anderson, "The Concept of Imagination in Maimonides' *The Guide of the Perplexed*" (unpublished paper, 1999), pp. 3, 9. Alfred Ivry, "Triangulating the Imagination: Avicenna, Maimonides, and Averroes," in Pacheco and Meirinhos, *Intellect et imagination dans la philosophie médiévale*, Vol. 1, pp. 667–76, on p. 675.

[66] For Maimonides' intentional contradictions, see Leo Strauss, "Introduction," in *The Guide of the Perplexed*, trans. Pines, pp. xv ff. According to J. L. Kraemer, Maimonides uses the esoteric method of dispersion (*tabdīd*), which as Paul Kraus showed, was that of the alchemists ("Moses Maimonides: An Intellectual Portrait," in Kenneth Seeskin, ed., *The Cambridge Companion to Maimonides* [Cambridge, MA: Cambridge University Press, 2005], pp. 10–57 on pp. 41–2, 55 n. 132). For this method of Maimonides, see José Faur, "Maimonides on Imagination: Towards a Theory of Jewish Aesthetics," *The Solomon Goldman Lectures* (Chicago: Spertus College of Judaica, 1993), Vol. 6, pp. 89–104; Heidi Ravven, "Some Thoughts on What Spinoza Learned from Maimonides about Prophetic Imagination," *Journal of the History of Philosophy* 39(2–3) (2001): 193–214, on pp. 203–10.

[67] Harry A. Wolfson, "Halevi and Maimonides on Prophecy," *Proceedings of the American Academy of Jewish Research* 11 (1941): 105–63. Sirat, *Visions*, pp. 136–46. Kreisel, *Prophecy*, pp. 198ff. Macy, "Prophecy in al-Farabi and Maimonides." Faur, "Maimonides on Imagination." Sara Klein-Braslavy, *King Solomon and the Philosophical Esotericism in Maimonides' Thought* (Jerusalem: Magnes Press, 1996), pp. 120ff., 170–87, 203–9 (in Hebrew). For a bibliography on the topic, see Jacob Y. Dienstag, "Maimonides and Prophecy: Bibliography," *Daʿat* 37 (1996): 193–228. See, more recently, W. Z. Harvey, "Three Theories."

[68] *Guide* Part II, chapter 36 (pp. 372–3); Part I, chapter 73 (pp. 210–11); Part I, chapter 49 (p. 109); Anderson, "Concept of Imagination," pp. 4–5. Faur, "Maimonides on Imagination," p. 94. Ravven, "Some Thoughts," p. 196. Klein-Braslavy, *King Solomon*, pp. 83–9, 135, 144.

[69] *Virtuous City*, ed. Dieterici, pp. 48–9. Walzer's translation of this passage (*Perfect State*, pp. 213–15) is misleading. See Kahana-Smilansky, "Science of Dreams," pp. 124–6.

[70] On imagination see *Guide* Part II, chapter 12 (pp. 279–80); Part I, chapter 73 (p. 209); Part II, chapter 32 (p. 361); Part II, chapter 36 (pp. 369ff.). Anderson, "Concept of Imagination," pp. 1–2. Ravven, "Some Thoughts," p. 196. Faur, "Maimonides on Imagination," pp. 94–100. On "representation," see the bibliography in Michael Schwarz, *The Guide of the Perplexed: Translated into Hebrew* (Tel Aviv: The University Press, 2002), Vol. 1, p. 5 n. 6 (Heb.).

[71] José Faur, *Homo Mysticus: A Guide to Maimonides' Guide of the Perplexed* (Syracuse: University of Syracuse Press, 1999), p. 73.

for intellectual perfection in prophecy, Maimonides is basically negative: Imagination is banished from the prophecy of Moses,[72] which is at the highest possible degree and completely intellectual. Imagination is a bodily, animal function; "desires of the imagination" and "vain imagining" are identified with false beliefs and characterize the multitude.[73] To accommodate for this human failing, the prophets must speak in images and metaphors when they wish to communicate prophetic truths to the people.[74]

Another puzzle is Maimonides' presentation of the status of divination or prognostication versus prophecy. The prophet's role is to predict the future: Successful prediction is no less than the test of his being a true prophet.[75] However, (following al-Farabi and Avicenna) Maimonides also holds that divination through "true dreams" is natural and accessible to all, including gentiles and women (*Guide* Part II, chapter 36). In themselves, however, these dreams do not elevate one to the ranks of the prophets, but rather to the cast of deceivers: idolaters, magicians, and politicians. The last do not commit themselves to either moral control or rational and theoretical proofs.[76] This categorization of "veridical" but immoral dreamers may be a polemic directed against the prophet of Islam; even if his dreams were true, this does not make him a prophet comparable to the biblical prophets.[77] Maimonides may have also had in mind "prophetic" aspirants in any religiopolitical community. In his view, true dreams become a means of prophecy only in people educated in philosophy who actualize their moral and intellectual perfection.[78] Otherwise, the valid prediction in their dreams is mixed with their desires and the mind's occupations during wakefulness.[79] The difference between prophets and mere diviners is decided neither by the nature of the divine overflow on the members of each category nor by the mental processes employed when they make their predictions, but by their moral perfection and social behavior.

A pragmatic point made by Maimonides is that encounters with angels, revelation, and the experience of being spoken to by God can take place only in a prophetic dream or vision (*mar'ah*; *mar'at ha-laylah*; *maḥazeh*). However, the dividing line between dream and vision is elusive. At the start of his discussion on the subject (*Guide* Part II, chapter 41), Maimonides implies that they are different: "It is not necessary that I explain what a dream is; as to 'vision' (Arab. *ru'yā,* Heb. *mar'ah*)." Perhaps he assumes that his readers are learned enough to know the difference.[80] *Mar'ah* and *maḥazeh* were interpreted as waking experiences,

72 *Guide* Part I, chapter 47 (p. 105); Part II, chapter 34 (p. 367); Part II, chapter 45 (pp. 402–3). Ivry, "Triangulating," pp. 675–6.

73 *Guide* Part I, chapter 2 (p. 25); Part I, chapter 17 (p. 43); Part I, chapter 34 (p. 74); Part I, chapter 62 (p. 132); Part I, chapter 32 (p. 70); Part II, chapter 12 (p. 441); Part II, chapter 25 (p. 328); Part II, chapter 29 (p. 347); Part III, chapter 14 (p. 457); Part III, chapter 15 (p. 460). Anderson, "Concept of Imagination," pp. 1–3. Klein-Braslavy, *King Solomon*, pp. 143, 203–7.

74 *Guide* Part I, chapter 73 (pp. 209ff.); Part II, chapter 46 (pp. 405–7); Part II, chapter 47 (pp. 407–9). Faur, "Maimonides on Imagination," p. 92. Ivry, "Triangulating," p. 676.

75 Kreisel, *Prophecy*, pp. 198ff.

76 *Guide* Part I, chapter 70 (p. 172); Part II, chapter 32 (pp. 360–3); Part II, chapter 37 (p. 374); Part II, chapter 38 (pp. 377–8); Part III, chapter 23 (p. 493); Part III, chapters 29–30 (pp. 515–17); Part III, chapter 37 (p. 546). Anderson, "Concept of Imagination," pp. 2, 5.

77 Eliezer Schlossberg, "Maimonides' Attitude towards Islam," *Pe'amim* 42 (1990): 38–60, on pp. 51–3 (Heb.). *Guide*, trans. Schwarz, Vol. 1, p. 375 n. 17.

78 *Guide* Part II, chapter 32 (p. 363); Part II, chapter 38 (p. 378); Part II, chapter 39 (pp. 379–81); Anderson, "Concept of Imagination," pp. 5–6.

79 *Guide* Part II, chapter 36 (pp. 369–73); *Guide* Part II, chapter 37 (p. 374); Part II, chapter 38 (p. 377). Anderson, "Concept of Imagination," pp. 5–6.

80 *Guide* Part I, chapter 69 (p. 166): "This treatise has been composed only for the benefit of those who have philosophized and have acquired knowledge of what has become clear with reference to the soul and all its faculties."

unlike a dream,[81] but Maimonides says that "amazing imaginations and dreams" can be seen in waking,[82] that angels are seen and communicated with in prophetic dreams as well as in prophetic visions, and that in either case an angel may be recognized as such or may be perceived as a human being who delivers a message.[83] Moreover, the same supernatural overflow is the cause of veridical dreams and prophetic visions: "[T]here is a difference only in degree, not in kind."[84]

Dreams and visions are ranked on the same scale, according to their prophetic significance: A lower level of prophecy is indicated by the dreamer-prophet's recognition that it "was a dream," whereas higher-level prophets affirm that they had "a revelation" or at least do not announce that they had a dream.[85] One distinction between dream and vision seems to be the status given to the experience of being spoken to by God. The divine announcement that kept Abraham from slaughtering his son (Gen. 22:11–12), a vision at the eleventh and highest (non-Mosaic) degree, "possibly" has been what God made him imagine. However, a similar experience in vision is denied such a purely imaginative status.[86] Does Maimonides imply that the divine voice heard in this case of prophetic vision is real?

The patriarch Abraham is Maimonides' most frequent adduced example of a prophet who had visions on different levels of prophecy.[87] These dream-visions are described on an ascending scale of significance; lower levels are distinguished by visual, and higher levels by aural, experience. At the eighth degree, Abraham's visions (as well as those of other prophets) are limited to symbols (*mešalim*), represented by visual objects and interpreted by the prophet himself.[88] The ninth degree is distinguished by hearing speech;[89] the tenth degree involves both seeing and hearing an angel.[90] As I already mentioned, at the eleventh degree, God "possibly" makes one imagine that he hears the divine words. This relative significance of visual and aural experience is stated in very similar fashion in tenth-century Islamic dream theory.[91]

Hebrew Translations

Before the middle of the thirteenth century, Jewish scholars seemed to have been incorporating psychological discussions into general philosophical works; however, the appearance of the subject is sporadic. One exception is the Arabic *PN*, whose impact on Jewish writers awaits further investigation. By the middle of the thirteenth century, though, the Hebrew library was enriched by translations of works specifically dedicated to psychology and dreams.

Averroes' *Epitome of the PN* was translated into Hebrew three times, notably by Moses Ibn Tibbon, *Beʾur/Qiṣṣur ha-ḥuš ve-ha-muḥaš* (Montpellier, 1254). This translation was made a

[81] Shem Ṭov ben Joseph, one of the traditional interpreters of the *Guide*, on *Guide* Part II, chapter 45 (p. 402).
[82] *Guide* Part I, chapter 37 (p. 374).
[83] *Guide* Part II, chapter 41 (pp. 385–8); Part II, chapter 42 (pp. 388–90); Part II, chapter 45 (p. 402).
[84] *Guide* Part II, chapter 36 (p. 370); Anderson, "Concept of Imagination," p. 4.
[85] *Guide* Part II, chapter 45 (pp. 399–400); Klein-Braslavy, *King Solomon*, pp. 177–88.
[86] *Guide* Part II, chapter 45 (p. 402). Cf. Part II, chapter 33 (pp. 365–6).
[87] *Guide* Part II, chapter 39 (p. 379); and see Part II, chapter 41 (pp. 385–6). On the significance of Abraham's sacrifice, see *Guide* Part III, chapter 24 (p. 501).
[88] *Guide* Part II, chapter 43 (pp. 391–3); Part II, chapter 45 (pp. 400, 401).
[89] *Guide* Part II, chapter 45 (p. 401); cf. Part II, chapter 44 (pp. 394–5).
[90] *Guide* Part II, chapter 45 (p. 402). cf. Idel, *Nocturnal Kabbalists*, pp. 67–8.
[91] H. Kahana-Smilansky, "Self-Reflection and Conversion in Medieval Muslim Autobiographical Dreams," in Marlow, *Dreaming across Boundaries*, pp. 99–130, on pp. 115–18. Cf. Samuel ben Ḥofni's account of dreams, n. 174 below.

few years after Moses Ibn Tibbon's activity in the court of Naples, where Averroes' *Epitome* had been translated into Latin by Michael Scot before 1236.[92] Another scholar associated with this court, Judah ben Solomon ha-Kohen of Toledo, abridged the chapter on the senses, memory, and sleep and dreams from Averroes' *Epitome* and included it in his Arabic philosophical encyclopedia, which he translated into Hebrew as *Midraš ha-ḥokmah* (Sicily, 1247). The chapters on psychology and dreams exhibit Judah's "predilection for succinctness," casting the subject matter in the form of questions and answers in "a reader-friendly way."[93] Nevertheless, Judah's encyclopedia, including these chapters, was scarcely used by future generations and was eclipsed by the translations of Averroes' various commentaries. About twenty years later, Shem-Ṭov Ibn Falaquera incorporated a full Hebrew translation of Averroes' *Epitome* into his encyclopedia *Deʿot ha-filosofim*. As noted by Steven Harvey, Ibn Falaquera complemented his translation by interpolating short passages borrowed from other commentaries by Averroes and added a section on "intuition" (*ʾomed*; in Arabic, *ḥads*), translated from Avicenna's *Kitāb al-šifāʾ*. This translation of Averroes' *Epitome* is clearer and more grammatically correct than Ibn Tibbon's,[94] but, to judge by the number of extant copies of the latter, it became the most popular work on this topic among Jews.[95]

At about the time that Moses Ibn Tibbon translated Averroes' *Epitome of the PN* from Arabic into Hebrew, the Provençal Solomon ben Moses Melguiri translated *Aristotle on Sleep and Wakefulness* into Hebrew from an unknown Latin source.[96] In both sequence and content, Melguiri's Hebrew text follows Aristotle's three treatises on sleep and dreams: It faithfully represents Aristotle's opinions and arguments on the causes of sleep in animals (*De somno et vigilia*), the definition of dreams and of the imagination (*De insomniis*), and different naturalistic explanations of "predictive" dreams, as well as the view that they are usually a matter of mere coincidence (*De divination per somnum*). Melguiri's treatise is, however, an adapted translation of the Aristotelian text. It deviates from Aristotle's text by adopting a Galenic brain-centered psychology and accounting for the effects of imagination in a manner that goes beyond Aristotle: For example, foreknowledge may be the outcome of the integration of scattered information. These changes can be said to "update" the Aristotelian theory by bringing it into line with contemporary medicine and psychology.[97]

Discussion

Some terms and ideas underwent various transformations as a result of their reception and translation into Hebrew. Al-Farabi's basic psychological concepts appear frequently in Jewish philosophical psychology: impulse (Hebrew *ha-koaḥ ha-meʿorer* or *ha-mitʿorer*),[98] sometimes

[92] Blumberg, *Averrois Epitome*, Hebrew ed., introduction, p. xi; Gad Freudenthal, "Maimonides' *Guide of the Perplexed* and the Transmission of the Mathematical Tract 'On Two Asymptotic Lines' in the Arabic, Latin and Hebrew Medieval Traditions," in Robert S. Cohen and Hillel Levine, eds., *Maimonides and the Sciences* (Dordrecht: Kluwer, 2000), pp. 35–56, on pp. 39–40.

[93] Resianne Fontaine, "Judah ben Solomon ha-Cohen's *Midrash ha-Ḥokhmah*: Its Sources and Use of Sources," in S. Harvey, ed., *The Medieval Hebrew Encyclopedias of Science and Philosophy* (Dordrecht: Kluwer, 2000), pp. 191–210, on pp. 192, 199.

[94] Steven Harvey, "Shem-Tov Ibn Falaquera's *Deʿot ha-Filosofim*: Its Sources and Use of Sources," in idem, ed., *Medieval Hebrew Encyclopedias*, pp. 211–37, on pp. 213–14, 229–30.

[95] Averroes, *Epitome of the PN*, ed. Blumberg (Hebrew edition), pp. 5, 12f.; James T. Robinson, "Gershom ben Solomon's *Shaʿar ha-Shamayim*: Its Sources and Use of Sources," in Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 248–74, on p. 261 n.70.

[96] Steinschneider (*HÜ*, p. 283) dated the translation to 1250–1300.

[97] Hagar Kahana-Smilansky, "*Aristotle On Sleep and Wakefulness*: A Medieval Hebrew Adaptation of an Unknown Latin Treatise," *Aleph* 10/1 (2010): 67–118.

[98] *HÜ*, pp. 24, 26–8.

confused with the appetitive faculty,[99] and Farabi's conception of culturally and linguistically dependent symbolism ("imitations"; *ḥiqquyim*) in dreams.[100] Because al-Farabi's theories were adopted by other Arabic-Islamic philosophers, their routes of transmission require particular study in each case. Averroes incorporated the idea of culturally relative symbolism into his *Epitome of the PN*, from which, in Moses Ibn Tibbon's translation, it reached Gersonides.[101] A term often mentioned with "imitations" is *mešalim*, which either means "parables" in the biblical sense of the word[102] or renders the Arabic *amthāl*, *amthila* (sing. *mathal*), which denote "similes," "metaphors," or "symbols."[103]

What the attitude of Jewish philosophers was toward Avicenna's psychology is an intricate question. Specifically, to what degree did al-Ghazali's presentation of this doctrine decide its reception among Jews? A case in point is the denigration of the faculty of imagination in Jewish thought, particularly before the thirteenth century: Judah Halevi (ca. 1075–1141) warned his readers of following "the two rebellious demons (*šayyāṭīn*)" – the faculties of imagination and "estimation" (*al-wahmīya*).[104] Abraham Ibn Daud (ca. 1110–80) equated the "bestial imagination" with the evil impulse and presented the imagination as dangerously delusive and interfering with prophecy.[105] This is curious, because Ibn Daud's psychology has been shown to rely on Avicenna,[106] and some of Halevi's psychological teachings go back to Avicenna's doctrine of *wahm*.[107] Maimonides' concept of the imagination is similarly negative, and it influenced thirteenth-century discussions in which imagination is designated "the evil impulse" (*yeṣer ha-raʿ*), the serpent of the Garden of Eden, or Satan.[108] Apparently, Avicenna's concepts of imagination and *wahm*, which have been severely criticized by al-Ghazali,[109] were not fully embraced by Jewish thinkers. Maimonides does not use *wahm* in the Avicennian sense.[110] Judah Ibn Tibbon (d. ca. 1190) usually translates "the faculty of

99 Sara Klein-Braslavy, *Maimonides' Interpretation of the Genesis Stories about Adam* (Jerusalem: Rubin Mass, 1986), pp. 215–22 (in Hebrew). Falaquera's account of impulse in *Deʿot ha-filosofim*, MS Parma 3156 (IMHM 13897), f. 187a, is taken over by Simeon Duran, *Magen 'Avot* (Livorno, 1785; Jerusalem: Makor, 1970), p. 77bb.

100 T. A. M. Fontaine, *In Defence of Judaism: Abraham ibn Daud* (Assen: Van Gorcum, 1990), pp. 143–4. See additional references in Jacob Klatzkin, *Thesaurus Philosophicus* (Berlin: Eshkol, 1928), Vol. 1, pp. 324–6.

101 Averroes' *Epitome of the PN*, ed. Blumberg (Hebrew edition Heb.), p. 55. Cf. Gersonides, *Wars* Part II, chapter 6, p. 18bb ff.; idem, commentary on Gen. 40:1–20, in *Perušei ha-Torah le-Rabbenu Levi ben Geršom*, ed. Jacob Leyb Levi (Jerusalem: Mosad ha-Rav Kook 1992), Vol. 1, pp. 228–9.

102 See, e.g., Maimonides, *Guide* Part II, chapters 43–4.

103 Aaron Greenbaum, ed., *Peruš ha-Torah le-Rav Šemuel ben Ḥofni Ga'on* (Jerusalem: Mekişe Nirdamim, 1979), pp. 115–16. Kahana-Smilansky, "Science of Dreams," pp. 179–263.

104 W. Z. Harvey, "Three Theories," pp. 300–1; Howard Kreisel, "Judah Halevi's Influence on Maimonides: A Preliminary Appraisal," *Maimonidean Studies* 2 (1991): 95–121.

105 Fontaine, *Defence of Judaism*, pp. 142–5; Amira Eran, *From Simple Faith to Sublime Faith* (Tel Aviv: Hakibbutz Hameuchad, 1998), pp. 58–65, 135ff. (in Hebrew).

106 Fontaine, *Defence of Judaism*, pp. 55–80, 143–4, 257–8; Eran, *Sublime Faith*, pp. 61ff., 216–17. More recently, Fontaine stated that Ibn Daud's psychology was influenced by Avicenna's *Kitāb al-šifā'* and *Kitāb al-najāt*, and by al-Ghazali; see "Abraham Ibn Daud," *Stanford Encyclopedia of Philosophy* (available online at http://plato.stanford.edu/entries/abraham-daud; viewed August 26, 2006).

107 *The Book of Refutation and Proof on the Despised Faith* (*The Book of the Khazars*), ed. David H. Baneth and Ḥaggai ben Shammai (Jerusalem: Magnes Press, 1977), III.5 (p. 93) and V.12 (pp. 202–3, 205, 207; *al-quwwa al-wahmiya* or *al-mutawahhima*). On the question of Halevi's immediate source, see Harvey, "Islamic Philosophy and Jewish Philosophy," p. 352.

108 *Guide* Part II, chapter 12 (p. 280); Part II, chapter 30 (p. 356f.); Part III, chapter 22 (pp. 487–90). Anderson, "Concept of Imagination," p. 1. Faur, "Maimonides on Imagination," pp. 90, 93 nn. 1, 13. Klein-Braslavy, *Maimonides' Interpretation of Genesis*, pp. 193–215; idem, *King Solomon*, pp. 143, 203 n. 2, 206–9. See bibliography in *Guide*, trans. Schwarz, Vol. 1, p. 368 n. 64.

109 Black, "Estimation," pp. 221ff.

110 *Wahm* is usually rendered by Michael Schwarz as *dimyon šav'* (*Guide*, trans. Schwarz, index, Vol. 2, p. 774). Pines has "fancy," "fanciful notions" (*Guide*, pp. 222, 226, 404), or "estimative faculty" (p. 112; glossary).

wahm" as *ha-koaḥ ha-raʿyoni* or *raʿyon*, terms that were adopted by later Hebrew translators, including Abraham Ibn Ḥisdai's translation of al-Ghazali's *Mizān al-ʿamal*, entitled *Moʾzenei ṣedeq* (before 1235), and *ʾEmunah ramah*, one of the Hebrew translations of Abraham Ibn Daud's work (1391).[111] Scholars writing directly in Hebrew, such as Nissim ben Solomon of Marseilles, also made use of them.[112] This does not imply, however, that the concept itself was adopted or even understood.

Avicenna's concept of "intuition," *ḥads*, received its full exposition in Jewish philosophy in Shem-Ṭov Ibn Falaquera's *Deʿot ha-filosofim.*[113] However, it was preceded by Maimonides' faculty of *šuʿūr*. This faculty is described as leading to "complete" knowledge: It allows the mind to "survey all the premises and infer the conclusions in the shortest time possible" as well as to issue admonitory predictions. It exists in all humans and is stronger in the prophets.[114] The meaning of *šuʿūr* in Maimonides (*Guide* Part II, chapter 38) differs from its ordinary signification ("being aware, being conscious of, sense").[115] Therefore, several scholars have argued that in this passage Maimonides substitutes *šuʿūr* for Avicenna's notion of *ḥads.*[116] Samuel Ibn Tibbon's influential Hebrew translation of the *Guide*, which renders *šuʿūr* as *ha-koaḥ ha-mešaʿer* and *šiʿur* (literally "estimative faculty, estimation"),[117] contributed to the acceptance of the latter terms as equivalents of Avicenna's *ḥads* in post-Maimonidean Jewish philosophy.[118]

Maimonides' views on dreams and divination also determined Samuel and Moses Ibn Tibbon's mistranslation of *takahhun* and *kahāna* (the mantic ability to prognosticate, clairvoyance) as *qesem* (sorcery), thus associating it with magical practice. According to Samuel Ibn Tibbon, this lexical choice goes back to Maimonides himself.[119] The distinction between a mental talent for prognostication and mere sorcery was thus blurred in most subsequent Jewish discussions of this problem.

Cf. Muḥammad Ibn Manẓūr, *Lisān al-ʿArab*, ed. ʿAli Shiri (Beirut: Dar Sadir 1988), Vol. 15, p. 416b. Black, "Estimation," pp. 223ff.

111 For *ha-koaḥ ha-raʿyoni* cf. Judah Halevi, *Sefer ha-Kuzari*, trans. Juda Ibn Tibbon, ed. A. Ṣifroni, Part V, chapter 12 (Tel Aviv: Maḥbarot le-Sifrut, 1988), p. 301. See also Wolfson, "Internal Senses," p. 287 n. 65. For Ibn Daud see Fontaine, *Defence of Judaism*, pp. 63–4. Eran, *Sublime Faith*, pp. 61–2. Harvey, "Three Theories," p. 294. Klatzkin, *Thesaurus Philosophicus*, Vol. 2, p. 82.

112 *Maʿaseh Nissim*, chapter 12, ed. Howard Kreisel (Jerusalem: Mekiṣe Nirdamim, 2000), introduction, p. 21.

113 See n. 94.

114 *Guide* Part II, chapter 38 (p. 376).

115 Cf. *Avicenna's De Anima*, ed. Rahman, p. 281. Cf. Abū al-Barakāt al-Baghdādī, *Kitab al-muʿtabar fī al-ḥikma* (Hyderabad: Dar al-Maʿarif al-ʿUthmaniya, 1938/39), Vol. II, chapter 21, pp. 394–5.

116 Shlomo Pines, "The Probability of the Revival of a Jewish State according to Ibn Kaspi and Spinoza," *Studies in the History of Jewish Philosophy* (Jerusalem: Mosad Bialik, 1977), pp. 277–305, on pp. 280–2 (in Hebrew). Jacob Levinger, *Maimonides as Philosopher and Codifier* (Jerusalem: Mosad Bialik, 1989), pp. 35–6 (in Hebrew). Benyamin Abrahamov, "Maimonides' and Ibn Sina's Theory of *Ḥads*: A Re-examination of *The Guide of the Perplexed* II, ch. 38" (forthcoming in the Proceedings of the 7th Conference of the Society for Judaeo-Arabic Studies [Strasbourg, 1995]). Amira Eran, "The Conception of *Ḥads* in Maimonides and Judah Halevi," *Tura* 4 (1996): 117–46 (in Hebrew); bibliography in *Guide*, trans. Schwarz, Vol. 1, p. 331 n. 9.

117 Samuel Ibn Tibbon, *Peruš ha-millim ha-zarot*, ed. Judah Even-Shemuel (Jerusalem: Mosad ha-Rav Kook, 1981), p. 59.

118 For Ibn Kaspi, see Pines, "The Probability of Revival," pp. 278–9. Cf. Levinger *Maimonides as Philosopher and Codifier*, pp. 35–6. Abrahamov, "Maimonides and Ibn Sina's Theory of *Ḥads*." The sense of *šuʿūr* in Abraham Maimonides' *Kifāyat al-ʿābidīn* is the same as that given it by his father. Cf. Samuel Rosenblatt, ed. and trans., *The High Ways to Perfection of Abraham Maimonides* (Baltimore: John Hopkins Press, 1927), Vol. II, f. 36a (p. 98), f. 44a (p. 130).

119 Samuel Ibn Tibbon, *Peruš ha-millim ha-zarot*, p. 58. Cf. *Guide* Part II, chapter 32 (p. 363). Averroes' *Epitome of PN*, ed. Blumberg, pp. 66, 67 (Arabic edition) and pp. 43, 44 (Hebrew edition). Altmann, "Gersonides' Commentary," pp. 9–10; Gersonides, *Wars*, Part II.

I mention in passing that the Arabic *wahm* (literally "illusion, delusion, fancy") was misleadingly translated into the Latin as "aestimatio."[120] Thus the Arabic terms *šuʿūr* and *wahm* were inadequately rendered into (respectively) Hebrew and Latin terms denoting estimation. Was there any causal relation between the translators' choices of these misleading terms in their respective languages?

On the crucial issue of whether significant and admonitory dreams have divine causes, Averroes' statements in the *Epitome of the PN* appear to be inconsistent.[121] His views (that were believed to represent Aristotle's) were soon compared to Aristotle's doctrine as presented in Melguiri's *Aristotle on Sleep and Wakefulness.* Meguiri's text, following Aristotle, attempts to explain prescience by natural causes and states that dreams have no divine cause (respecting Aristotle's *De divinatione* 462b12ff.). Several Jewish thinkers from the thirteenth century onward cite Melguiri's Hebrew *Aristotle on Sleep and Wakefulness.* As noted by Moritz Steinschneider, Melguiri's treatise formed the basis for the tenth tract ("On Sleep and Wakefulness") in Gershom ben Solomon's popular encyclopedia *Šaʿar ha-šamayim.* Gershom wrongly attributed Melguiri's Hebrew treatise to Avicenna and supplemented his discussion of sleep and dreams from other texts available to him in Hebrew versions.[122] Melguiri's work was probably known to Gersonides and was employed by Jewish physicians in Provence and halakhic scholars in Spain, such as Simeon Duran and Menaḥem ben Zeraḥ.[123]

As already mentioned, the treatise translated by Melguiri argues that prescience may come out of the integration of scattered information in dreams. Who else among Jewish thinkers discussed this issue? Averroes' *Epitome of the PN* describes the unified activity of the mental faculties, which produces supernal awareness. This duly appears in Ibn Tibbon's Hebrew translation and was one of the sources of Gersonides' formulation of the idea in his commentary on Averroes' *Epitome.* Gersonides states that, at the time of dreaming, the experience of internal representations is combined with the contemplation of basic premises. Because the imagination is particularly active, it can drive the intellect to draw general rules from this experience and reach conclusions about theoretical problems. These conclusions are comparable to prophetic apprehensions.[124]

To sum up, there is a significant difference between the Jewish and Islamic attitudes about the imagination: As opposed to Islamic philosophers' praise of its creativity, a negative view of the creative imagination is prevalent in medieval Jewish thought. At least in the case of Maimonides, this attitude is related to worries about the social dangers of magic and the ease with which political leaders can incite the imagination of "the multitude." It would be interesting to know more about the reasons for this stance and whether it reflects the critique of Avicenna's conception of *wahm* by al-Ghazali and Averroes. Nevertheless, this negative view was partly balanced following the thirteenth-century Hebrew translations of the Pseudo-Aristotelian psychological works already mentioned, as one can see, for example, in Gersonides[125] and Simeon Duran (1361–1444).

Medieval Jewish writers explained dreaming and foreknowledge in psychological terms borrowed from Islamic philosophy, some of which were transformed, accidentally or

[120] Rahman (*Avicenna's Psychology*, pp. 79–81) rejects the opinion that Avicenna identified *wahm* with *ẓann* (doxa). Cf. Black, "Estimation," p. 228f.

[121] *Epitome of PN*, ed. Blumberg, pp. 66ff. (Arabic edition) and pp. 43ff. (Hebrew edition). For attempts to settle these inconsistencies, see Ivry, "Triangulating," pp. 672–3, and Miklós Maróth, "The Science of Dreams in Islamic Culture," *Jerusalem Studies in Arabic and Islam* 20 (1996): 229–36, on pp. 235–6.

[122] Robinson, "Gershom ben Solomon," pp. 248–74.

[123] Kahana-Smilansky, "*Aristotle on Sleep and Wakefulness*," pp. 82–5.

[124] Altmann, ed., "Gersonides' Commentary," lines 28, 71ff., 268–73, 361–80.

[125] Gersonides, *Wars* Part II, chapter 6, p. 19aa; Altmann, "Gersonides' Commentary," lines 301f. On the imagination as the recipient of supernal knowledge in dreams, see Gersonides, *Wars*, 19aa–ab, 19ba–bb, 20ab–ba; idem, commentary on Gen. 42:8, *Perušei ha-Torah*, 1: 231–44.

intentionally, in this process. Avicenna's complex psychology was used, to varying extents, as early as the twelfth century by Abū al-Barakāt, Judah Halevi, Abraham Ibn Daud, Maimonides, and later Shem-Ṭov Ibn Falaquera. From the middle of the thirteenth century, psychological theories of dreams were disseminated mainly through the Hebrew translations of Averroes' *Epitome of the PN* and Melguiri's *Aristotle on Sleep and Wakefulness*, which some readers believed to be by Avicenna. Both texts bring together the latest observations and finest discussions of physiological psychology and present the opposing doctrines of the divine or natural origin of dreams, both attributed to Aristotle. Later Jewish scholars compared these views to those of Maimonides. The Arabic translation of Galen's *On Diagnosis through Dreams* was probably available in Spain (see immediately below), so we can assume that certain Jewish writers were acquainted with its doctrines.

MEDICAL PSYCHOLOGY: SLEEP, DREAMS, AND MADNESS

The regulation of sleep and waking, problems of metabolism, and the exhaustion of the mental functions are discussed in the medical literature as part of a healthy regimen: Emotional or intellectual exasperation was held to account for agitated sleep and frightening dreams, as well as mental disturbances and madness. The Hippocratic doctrine, approved by Aristotle (*De divinatione* 463a5–20), held that changes in patterns of sleep and dreaming indicate changes in health and used them as predictive signs for somatic and mental pathology. This doctrine was developed in Galen's *De dignotione ex insomniis* (On Diagnosis through Dreams). The question whether *De dignotione* was translated into Arabic[126] receives an affirmative answer by the testimony of Moses Ibn Ezra's *Kitāb al-muḥāḍara*: He quotes in Arabic, in Galen's name, three opinions from *De dignotione* in the same order as they appear in the Greek text; his terminology indicates an Arabic source.[127] Thus far this seems to be the only textual evidence for the existence in Spain of an Arabic translation of Galen's *Diagnosis through Dreams*, preceding by five centuries the testimony by Ḥājjī Khalīfa (seventeenth century).[128]

The doctrine of premonitory dream-signs was widespread in Islamic literature and Arabic medical encyclopedias: Dream-signs were taken to signify the four humors (blood, phlegm, yellow bile, and black bile), the four qualities (heat, cold, dryness, and moistness), hunger or a surfeit of food, pains, worries, depression, or sexual desire.[129] In the Galenic tradition of the ninth century, sleep was defined as the natural return of the soul into the central part of the body to facilitate digestion and production of the vital spirit. The power of sense perception was said to turn inwardly as well, to invigorate mental activity during sleep.[130] The Islamic medical encyclopedias devoted chapters to the subject of admonitory dreams and specified the dream-images that warn of impending serious conditions such as epilepsy,

[126] See Gotthard Strohmaier, "The Uses of Galen in Arabic Literature," in Nutton, *The Unknown Galen*, pp. 113–20, on p. 119. Galen abridged this doctrine in his *Commentary on Hippocrates Epidemics I* and *The Second Commentary on Hippocrates' Humors*, which were translated into Arabic. See *Hunain Galenübersetzungen* (see n. 137), Nos. 95–6, pp. 41–41/34–5. These treatises are not known to have a Hebrew translation.

[127] Halkin, *ʿIyyunim*, p. 120. Cf. *Claudi Galenii Opera Omnia*, ed. Carl Gottlob Kühn (Hildesheim: Georg Olms, 1964–65), Vol. 6, pp. 833–4; Steven M. Oberhelmann, "Galen, 'On Diagnosis from Dreams'," *Journal of the History of Medicine* 38 (1983): 36–47, on pp. 45–6.

[128] *Kašf al-ẓunūn ʿan asāmī al-kutub wa'l-funūn*, ed. Gustav Fluegel (Leipzig: Oriental Translation Fund, 1835–58), Vol. 2, p. 312.

[129] Kahana-Smilansky, "Science of Dreams," pp. 103–18. Cf. Helmut Gaetje, *Studien zur Überlieferung der Aristotelischen Psychologie im Islam* (Heidelberg: C. Winter, 1971), pp. 136–9.

[130] Al-Kindi, "On the Essence of Sleep and Dreams," pp. 295–9, 307–8. Cf. Galen, *De dignotione ex insomniis*, in Kühn, *Galenii Opera*, Vol. 6, pp. 832–5, on p. 832; Oberhelmann, "Galen, 'On Diagnosis from Dreams,'" pp. 44ff.

apoplexy, and mania.[131] This doctrine was associated with the theory of mental illnesses that was taught mainly under the rubric of "melancholy."[132]

Popular versions of the humoral dream theory appear in tenth-century Jewish works in both Arabic and Hebrew.[133] Medical versions of it became available in Hebrew at least from the second half of the thirteenth century. Al-Rāzī's *al-Manṣūrī* was translated into Hebrew twice.[134] The Hebrew translation of Avicenna's *Canon*, from the Arabic, was made in 1279 by Nathan ha-Meʿati.[135] On this subject Gershom ben Solomon collates Aristotle *De somno* and Averroes' commentary on Avicenna's medical *Arjūza* (Hebrew by Moses Ibn Tibbon)[136] and explains that dream-images indicate somatic changes because "the faculty of imagination follows the bodily temperaments."[137]

Another Galenic treatise, *On Sleep and Wakefulness (and Emaciation)*, extant only in Arabic translation and known from the early tenth century,[138] is significant for our survey because Maimonides quoted it often in his *Medical Aphorisms* (*Fuṣūl Mūsā fī al-ṭibb; Pirqei Mošeh bi-refuʾah*).[139] This treatise deals with the benefits of sleep, with the distinction between healthy sleep and pathological states such as coma, but not with dreams. In passing, it mentions the basic premises of Galen's brain-centered psychology: The brain is "the leader" of the organism, "the source of sensation and movement," and "the central [organ of] perception" (77b, 75a). It contains the "locations of imagination and memory" (77a). Medical views of sleep disturbances were transmitted also through the Pseudo-Aristotelian *Problemata physica*, translated into Arabic by Ḥunayn Ibn Isḥāq; its first four chapters were rendered into Hebrew by Moses Ibn Tibbon (1264). They explain the causes of sleep, insomnia, and lethargy, and they discuss sleep in relation to drunkenness, because the brain and the "psychic spirit" are affected in a similar way in both states.[140]

Some points emphasized by Jewish physicians are based on observation, such as the attempt to determine the age of the onset of dreaming. Aristotle maintained that it was the age of four or five (*De insomniis* 462b4–6, 456b33–7a5; *De historia animalium* Book IV, Part

[131] Al-Razi, *Al-Manṣūrī*, II.19–23; IV.212; IX.15 (ed. Siddiqi, pp. 92–5, 210–14, 385–6, respectively). For ʿAlī b. al-ʿAbbās al-Majūsī, *Kāmil al-ṣināʿa al-ṭibbīya*, see Manfred Ullmann, *Islamic Medicine* (Edinburgh: Edinburgh University Press, 1978), pp. 63–4. For Avicenna's *Canon* see n. 22 above and Michael W. Dols, *Majnūn: The Madman in Islamic Society* (Oxford: Clarendon Press, 1992), pp. 85–7.

[132] Dols, *Majnūn*, index; S. Muntner, "Ancient Manuscripts: *On Melancholy*," *Ha-Rofeʾ ha-ʿivri* 25 (1952): 85–94; 26 (1953): 209–17 (in Hebrew).

[133] See nn. 174–7 below.

[134] *HÜ*, pp. 724–6.

[135] Chaim Rabin, "The History of the Translation of the *Canon* into Hebrew," *Melilah* 3–4 (1950): 132–42 (in Hebrew).

[136] *Šaʿar ha-šamayim* (Warsaw, 1875), f. 71a. For Gershom's use of Averroes' commentary on *Arjuza*, see Robinson, "Gershom ben Solomon," p. 261 n. 73.

[137] Gad Freudenthal, in "Four Implicit Quotations of Philosophical Sources in Maimonides' *Guide of the Perplexed*," *Zutot* 2 (2002): 114–25, discussed a similar phrase in Maimonides' *Guide* (Part III, chapter 12). Freudenthal maintained that although this phrase had become a common usage, in Maimonides' case it indicates his acquaintance with Galen's *That the Powers of the Soul Follow upon the Temperament of the Body*. See *Hunain ibn Ishāq über die syrischen und arabischen Galenübersetzungen*, ed. and trans. G. Bergsträsser (Nendeln, Liechtenstein: Kraus Reprint, 1966), No. 123, pp. 50/41. It is not known to have a Hebrew translation.

[138] Rainer Nabielek, "Die pseudo-galenische Schrift 'Über Schlaf und Wachsein,'" Med. dissertation, Humboldt Universität, Berlin, 1977, pp. 29ff. The only known extant manuscript was copied in Andalusia in 1065. Prof. Gotthard Strohmaier kindly provided me with a photocopy.

[139] Nabielek (previous note), p. 29ff. *Pirqei Mošeh bi-refuʾah* was translated into Hebrew a number of times (between 1279 and 1283). See Gerrit Bos, "Galen in Maimonides' *Medical Aphorisms*," in Nutton, *The Unknown Galen*, pp. 139–52, on pp. 140–1.

[140] *The Problemata Physica Attributed to Aristotle: The Arabic Version of Ḥunain Ibn Isḥāq and the Hebrew Version of Moses Ibn Tibbon*, ed. L. S. Filius (Leiden: Brill, 1999), Treatise III, Questions 17, 20; Treatise IV, Questions 28–9. For the Hebrew translation, see Filius, pp. xiii ff.; *HÜ*, p. 231.

10, 537b14–16). By contrast, Gershom ben Solomon argues that dreaming starts in early infancy, observing that infants attempt to suckle and to cry in their sleep.[141] The terrors of sleeping young children were mentioned in earlier Hebrew medical literature, without specifying their age.[142]

The sleep disturbance known as somnambulism puzzled many writers. Aristotle (*De somno* 456a24–9) mentioned that the actions of some sleepers are like those performed in wakefulness, but they do not remember them on being awakened.[143] Galen discussed the question of what causes involuntary actions in sleep that look like voluntary actions. His solution that the involuntary actions in sleep resemble actions performed absentmindedly in waking (*De motu musculorum*) was found by Maimonides to be insufficient: It does not clarify the causes of these actions in the absence, during sleep, of volition and rational choice.[144] Gershom ben Solomon may have been familiar with this discussion, but he adds his own description of somnambulism in a Jewish man "of our own time."[145] Gershom accounts for this disturbance by the combination of two causes: (a) The sleeper's brain was "alarmed" by vapors produced by his bad temperament and, (b) his unfulfilled desires affected his imagination during sleep and drove him to action. This "Freudian" explanation is comparable to al-Farabi's account of impulse.[146] Gershom concludes that the man would have gone completely insane had he suffered from such a condition while awake, but in his sleep he becomes only "mildly insane."[147]

To conclude, the medical literature in Arabic and the medical treatises translated into Hebrew provided Jewish physicians as well as the literate public with discussions of the causes of sleep and sleep disturbances. The doctrine that assigned a decisive influence on dreams and mental states to changes in the bodily humors was promoted by specific chapters in well-known Arabic medical encyclopedias as well as other literary genres. The significance of the medical discussions is that they were limited to natural explanations, that is, the physiological and mental causes of dreams, and often placed more emphasis on observation and treatment.

SLEEP AND DREAMS IN THE CLASSIFICATION OF THE SCIENCES

Jewish encyclopedias of the sciences blossomed from the twelfth century onward, from the *Kitāb al-muʿtabar,* composed in Arabic in twelfth-century Baghdad, to those written later in southern France in Hebrew. The classification of psychology and dreaming in an encyclopedia signify the author's views on the relations between these two subjects, as well as their position in the hierarchy of the sciences. A writer who regarded dreams as divine inspiration obviously classified them under theology or metaphysics, thus indicating his outlook on the limits of natural science.

There are two main classifications of psychology and dreaming in the Arabic tradition: under metaphysics or under physics. The first is found in the *Epistles of the Brethren of Purity* and various writings of al-Ghazali: Sleep is classed with animal physiology, among the lower

141 *Šaʿar ha-šamayim,* p. 53ab.

142 Maimonides, "Commentary on Hippocrates' *Aphorisms,*" §III.24, in *Ketavim refuʾiyim,* ed. S. Muntner (Jerusalem: Mosad ha-Rav Kook, 1961), Vol. 3, p. 62.

143 Aristotle says (*De somno* 456a24–29) that he discussed this topic in the *Problemata,* but this discussion is found neither in the extant Greek *Problemata* (David Gallop, *Aristotle on Sleep and Dreams* [Oxford: Oxford University Press, 1996], p. 130), nor in the medieval Arabic and Hebrew versions (*Problemata Physica,* ed. Filius).

144 See Bos, "Galen in Maimonides," pp. 149–50, referring to Maimonides' *Medical Aphorisms* I.33.

145 *Šaʿar ha-šamayim,* p. 62a.

146 See this article near nn. 19–20.

147 *Šaʿar ha-šamayim,* p. 62a.

faculties of the human soul; dreaming is separated from both sleep and psychology and discussed under theology or eschatology.[148] In contrast, the Aristotelian tradition in Islamic philosophy classified the theory of the soul (*ʿilm al-nafs*) as a whole, as well as the theory of dreaming, under physics. Aristotle himself considered his *De anima* and studies of sensation, memory, sleep, and dreams to belong to natural science. This classification recurs in Avicenna's *Epistle on the Divisions of the Intellectual Sciences*, which has been described by Hans Biesterfeldt as "a kind of blueprint" for his philosophical summa, the *Kitāb al-šifāʾ*.[149] According to Avicenna, the eighth "primary" natural science is "psychology and the mental powers of animals, particularly of man." In his system, dream interpretation is one of the derivative sciences of physics, along with medicine, astrology, and other empirical sciences that depend for their theoretical principles on the primary sciences.[150]

A number of Jewish encyclopedists followed Avicenna's classification, starting with the *Kitāb al-muʿtabar* by Abū al-Barakāt al-Baghdādī (Ḥibat-Allah ben Malka al-Isrāʾīlī, d. ca. 1169). Its psychology, in twenty-five chapters, takes up more than a third of the section on "physics" and includes a chapter entitled "Visions and Dreams," a subject that "belongs to the study of the soul and its functions."[151] Avicenna's classification is followed by the thirteenth-century Hebrew encyclopedias *Midraš ha-ḥokmah* by Judah ben Solomon[152] and *Deʿot ha-filosofim* by Ibn Falaquera,[153] as well as others.[154]

As was shown by Mauro Zonta, the general tendency of Jewish classifications of the sciences was to combine the systems of al-Farabi and Avicenna.[155] This may be reflected in Samuel Ibn Tibbon's *Peruš ha-millim ha-zarot*, appended to his Hebrew translation of Maimonides' *Guide of the Perplexed* (1204). In his account of Aristotle's physics, Ibn Tibbon used Avicenna's *Division of the Sciences*; the eighth fundamental natural science is psychology, studied from *De anima*. Samuel added a ninth, the study of *PN*, where Aristotle speaks "specifically about sensation, sleep and waking."[156] Similarly, the chapter "Sleep and Wakefulness; Dreams" in Gershom ben Solomon's *Šaʿar ha-šamayim* follows directly upon the discussion of human physiology.[157] The Karaite Elijah Basyatchi (or Bashyatchi, ca. 1430–90, Adrianople) used Avicenna's classification of the books of Aristotelian physics, with the addition of the Aristotelian *PN* as the ninth book and *On Sleep and Waking* as the tenth.[158]

Apparently, this indicates a tendency to relate the study of sleep and dreaming to psychology and the natural sciences. Nonetheless, several Jewish writers separated the study

[148] See *Epistles of the Brethren of Purity*, Nos. 26–30 (the soul and its faculties), No. 46 (dreaming); al-Ghazali, *The Revival of the Religious Sciences*, 6 vols. (Beirut-Damascas: Dar al-Kair, 1990), Part 8, Vol. 6, pp. 144ff (Arabic). For Ghazali see Louis Gardet and M. M. Anawati, *Introduction à la théologie musulmane* (Paris: Vrin, 1948), Part 1, chapter 2, pp. 118–24.

[149] Hans Hinrich Biesterfeldt, "Medieval Arabic Encyclopedias of Science and Philosophy," in Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 77–98, on p. 93.

[150] Avicenna, *Tisʿrasāʾil* (Cairo, 1908), p. 110. See Biesterfeldt, "Medieval Arabic Encyclopedias," pp. 92–5. Cf. al-Kindi, "On the Essence of Sleep and Dreams," pp. 293–4.

[151] *Kitāb al-muʿtabar*, Vol. 2, p. 418.

[152] See n. 93.

[153] Raphael Jospe, *Torah and Sophia: The Life and Thought of Shem-Tov Ibn Falaquera* (Cincinnati: Hebrew Union College Press, 1988), p. 58. Mauro Zonta, "The Reception of al-Fārābī's and Ibn Sīnā's Classifications of the Mathematical and Natural Sciences in the Hebrew Medieval Philosophical Literature," *Medieval Encounters* 1 (1995): 358–82.

[154] Moses da Rieti (d. 1460), in his *Miqdaš meʿaṭ*, and the Karaite Caleb Afendopolo employ the same Avicennian classification of psychology and dreams; see Zonta, "The Reception of al-Fārābī's and Ibn Sīnā's Classifications," p. 360f.

[155] Zonta, "The Reception of al-Fārābī's and Ibn Sīnā's Classifications," pp. 363–4.

[156] Samuel Ibn Tibbon, *Peruš ha-millim ha-zarot*, pp. 50–1.

[157] Robinson, "Gershom ben Solomon," pp. 259–61, 272–3.

[158] Elijah Bashyatchi, *ʾAdderet ʾeliyahu* (Jerusalem: Israel Karaite Community, 1966), p. 85a; *HÜ*, pp. 36–7.

of the soul from that of dreaming, following the model of the Brethren of Purity and al-Ghazali. This is Moses Ibn Ezra's approach: Although he used the second chapter of the Arabic redaction of Aristotle's *PN*, which "contains the science of dreams and their interpretation," he maintained that dream interpretation belongs to the "divine sciences of the invisible."[159] Similarly, the structure of Moses ben Judah's Hebrew encyclopedia *ʾAhavah be-taʿanugim* (1345) follows al-Ghazali's typical classification; sleep is classed with psychology in the natural sciences, but dreaming is discussed under the religious sciences.[160]

To obtain a fuller view of this question, let us consider a "quasi-encyclopedia"[161] and a planned encyclopedia.

Among the scientific chapters inserted in the comprehensive legal code by the Karaite Yaʿqub al-Qirqisani, *Kitāb al-anwār wa'l-marāqib* (first half of the tenth century), the chapter on dreams largely reproduces al-Kindi's psychological essay *On the Essence of Sleep and Dreams*, as was demonstrated by Georges Vajda.[162] Al-Qirqisani added to al-Kindi's theory a number of principles: a differentiation between dream causality and the theory of dream interpretation, logical methods of dream interpretation, and a distinction among three major causes of dreams – nature (bodily factors), the soul (senses and intellect), and divine agency.[163]

The role of Karaites in promoting the psychological study of dreams is reflected (in addition to the works by al-Qirqisani and Elijah Basyatchi, already mentioned) by the existence of a fragment in Hebrew characters of Avicenna's *Risālat al-manāmīya*, a fourteenth-century manuscript in the Firkovich collection of Karaite writings,[164] and by a treatise composed in Ladino by the Karaite Moses ben Baruch Almosnino (1510–80) at the request of Joseph Nasi, the Duke of Naxos.[165]

Finally, I mention the Hebrew encyclopedia planned or written (ca. 1211, Fustat) by Joseph ha-Bavli *Roš ha-Seder* (whose father Jacob was a disciple of the head of the Baghdad academy, Samuel ben ʾEli). Joseph's encyclopedia, known only from Geniza fragments, was to include, in addition to Jewish studies, seven books on the "foreign sciences": rhetoric (or homilies), history, medicine, astrology, dreaming, political prognostication, and "sciences" (*ḥokmot*). Louis Ginzberg and Alexander Scheiber doubted that this plan was ever carried out.[166] Two decades later (1231/2), Abraham Maimonides completed his (Arabic)

[159] Halkin, ed. and trans., *ʿIyyunim*, pp. 120, 130. Cf. the Arabic *PN*, "On Memory, Dreams and Dream Interpretation," MS Rampur 1752, f. 10a, lines 8–9; Hansberger, "The Transmission of Aristotle's *Parva Naturalia*," Vol. 2, p. 11, and ff. 41b, 42a.

[160] *ʾAhavah be-taʿanugim*, MS St. Petersburg C 009 (IMHM 69241); for "Sleep and Waking," see f. 58b. For dreams and divination, see "The Religious Sciences," Part III, Treatises 1 and 2 (f. 158b ff.). According to Zonta ("The Role of Avicenna and Islamic 'Avicennism' in the Fourteenth-Century Jewish Debate around Philosophy and Religion," *Oriente Moderno* 19 [2000]:647–60, on pp. 657–9), the writer drew upon Moses Narboni's commentary on *Kavvanot ha-filosofim* (i.e., Ghazali's *Intentions of the Philosophers*).

[161] "Quasi-encyclopedias" is Biesterfeldt's term for two Arabic works on the classification of the sciences ("Medieval Arabic Encyclopedias," p. 83). Baneth applied the term "*me-ʿein enṣiqlopediya*" to Abraham Maimonides' *Kifāya*; see D. H. Baneth, "Review" of S. Rosenblatt's edition of the *Kifāya*, *Qiryat Sefer* 8 (1931/2): 52–55, on p. 52 (in Hebrew). It is equally applicable to the works by al-Qirqisani and Abraham Yagel.

[162] "Etudes sur Qirqisānī," *Revue des études juives* n.s. 6 (1941–5): 87–123, on p. 115ff. See also Sirat, *Visions*, pp. 63–7. Daniel Frank, *Search Scripture Well: Karaite Exegetes and the Origins of the Jewish Bible Commentary in the Islamic East* (Leiden: Brill, 2004), pp. 95ff.

[163] Yaʿqub al-Qirqisani, *Kitāb al-anwār wa'l-marāqib* VI.14, ed. Leon Nemoy, *A Code of Karaite Law* (New York: Kohut Memorial Foundation, 1939–42), Vol. 3, 600–3.

[164] MS St. Petersburg II A 2162 (IMHM 60380).

[165] Moses ben Baruch Almosnino, *Tratado di los Soinios* (Thessalonica, 1553).

[166] Louis (Levi) Ginzberg, "The Remains of Three Books by R. Joseph *Rosh ha-Seder*, Son of R. Jacob *Rosh Bei Rabbanan*," *Ginzei Schechter* (New York: Jewish Theological Seminary of America, 1929), pp. 403–14 (in Hebrew). Alexander (Sándor) Scheiber, "New Fragments from the Book *Talmuda rabba* by Joseph ben Jacob ha-Bavli," *Geniza Studies* (Hildesheim: Georg Olms, 1981), pp. 1–15 (Hebrew section).

Kifāyat al-ʿābidīn, in which he devoted a detailed chapter to the mental faculties, sleep, and dreams.[167]

The scientific and philosophical encyclopedias appear to have played a pivotal role in propagating the psychology of the mental faculties and of dreams as part of the natural sciences. The study of dreams is often classified with sciences that are based on experience, like medicine and astrology, but it should be emphasized that until the fourteenth century, Jewish encyclopedias did not invoke astrological theories in their discussions of dreams. These, however, became common later. Whereas writers such as al-Qirqisani and Gershom ben Solomon viewed dreams as the result of natural, *psychological*, and divine causes, Isaac Abravanel in the fifteenth century and the physician and kabbalist Abraham Yagel (1553–1623) ascribe dreams to "natural, *astral*, and divine" causes.[168]

THREE ADDITIONAL THEMES

Three topics relevant to our subject could not be dealt with here: theoretical dream interpretation, psychological knowledge in commentaries and exegetical works, and astral theories of dreams. I wish nonetheless to present them briefly together with a bibliography, if only to make readers aware of them.

Several scholars have pointed out that the principles of dream interpretation that were formulated by the talmudic sages are similar to principles of interpretation employed in the exegetical literature. This implies that dreams were understood as textlike narratives.[169] No medieval Jews are known to me who introduced this idea into their writings, though they obviously devoted much attention to scriptural interpretation. Studies of medieval Jewish dream interpretation[170] have found little awareness of the professional principles of Artemidorus of Daldis (d. ca. 200), available in Arabic from the ninth century,[171] or of the Arabic interpretation of dreams that centered on the context of the dreamer's character, life, and speech.[172] Hence the extent to which the profession of dream interpretation was

[167] Rosenblatt, *The High Ways to Perfection*, Vol. 1, pp. 64–8. Abraham Maimonides' plan is comparable with that of the Brethren of Purity and of al-Ghazali's *Revival* (ibid., pp. 67–8). See: Aviva Schussman, "The Question of the Muslim Sources of Abraham Maimonides' *Kifāyat al-ʿābidīn*," *Tarbiz* 55(2) (1986): 229–51 (in Hebrew); Baneth, "Review."

[168] Isaac Abravanel, *Commentary on the Torah* (Jaffa: Torah va-Daʿat, 1955–1960), pp. 19b, 21a. On Yagel, see David Ruderman, *Kabbalah, Magic and Science: The Cultural Universe of a Sixteenth-Century Jewish Physician* (Cambridge, MA: Harvard University Press, 1988), pp. 31–2.

[169] Saul Lieberman, *Greek and Hellenism in Jewish Palestine*, 2nd Hebrew edition, (Jerusalem: Mosad Bialik, 1962), Vol. 2, pp. 204ff.; Maren Niehoff, "A Dream Which Is Not Interpreted Is Like a Letter Which Is Not Read," *Journal of Jewish Studies* 43 (1993): 58–84; Frank, *Search Scripture Well*, pp. 95ff.; Philip S. Alexander, "Bavli Berakhot 55a–57b: The Talmudic Dreambook in Context," *Journal of Jewish Studies* 46 (1995): 230–48; Avigdor Shenan, "The Dream in Midrash and the Dream-Midrash," in Dror Kerem, ed., *Various Opinions on Dreaming in Jewish Culture* (Jerusalem: Israel Ministry of Education, 1995), pp. 43–61 (in Hebrew).

[170] Aaron Greenbaum, "Dream Interpretation: History and Sources," *Areshet* 4 (19) (1966): 180–201 (in Hebrew). Joseph Dan, "The Dream Theory of *Ḥasidei Aškenaz*," *Sinai* 68 (1971): 388–93 (in Hebrew). Annelies Kuyt, "With One Foot in the Renaissance: Shlomoh Almoli and His Dream Interpretation," *Jewish Studies Quarterly* 6 (1999): 205–17; Isaac Afiq, "*Ḥazal's* Perception of the *Dream*," Ph.D. dissertation, Bar-Ilan University, 1990 (in Hebrew). Monford Harris, "Dreams in *Sefer Ḥasidim*," *Proceedings of the American Academy for Jewish Research* 31 (1963): 51–80. M. Steinschneider, "Das Traumbuch Daniel's," *Serapeum* 24(2–3) (1863): 193–201, 209–16.

[171] But see Frank, *Search Scripture Well*, pp. 95ff. For studies of Artemidorus, as well as medieval attitudes to dreams, see David Shulman and Guy G. Stroumsa, eds., *Dream Cultures: Explorations in the Comparative History of Dreaming* (Oxford: Oxford University Press, 1999), chapters 7–14. For Artemidorus in Islamic sources, see Maria Mavroudi, *A Byzantine Book of Dream Interpretation* (Leiden: Brill, 2002), index; John C. Lamoreaux, *The Early Muslim Tradition of Dream Interpretation* (Albany, NY: SUNY Press, 2002), index.

[172] Kahana-Smilansky, "Science of Dreams," pp. 179–263. See Pines's comments to his translation of the *Guide*, pp. 33 and 392.

practiced or even known among medieval Jews is not clear. Numerous Jewish treatises on dream interpretation, in Hebrew and Arabic, are extant in manuscript form, though, and research in this field has hardly begun. Early Jewish writings on dream interpretation are also quoted in Arabic sources such as *Kitāb al-qādirī fī al-taʿbīr* (1008) by Naṣr Ibn Yaʿqub al-Dinawari,[173] but the original texts remain to be identified.

The exegetical literature draws on the psychological theories, but the considerable task of evaluating the extent to which it does so has not yet been attempted. Here I mention but a handful of examples: As early as the biblical commentaries of Saadia ben Joseph Gaon (882–942), there is mention of psychological notions that recall Arabic theories.[174] The dream theory summarized by Samuel ben Ḥofni Gaon (d. 1013) in his commentary on the Torah closely resembles Avicenna's principles in the first part of *Risālat al-manāmīya.*[175] Samuel's theory was criticized by Abraham Ibn Ezra[176] and his commentator Eleazar ben Matitya,[177] apparently because of its naturalistic approach to "prophecy." However, Samuel ben Ḥofni's commentary was approved of and widely used, for example, by Abraham Maimonides in his commentary on the Torah.[178]

Jewish thinkers often discussed dreams and dream theory in relation to astrology and magic. The mystical-magical approach to astrological dreams has received more attention from modern scholars than has the more philosophical approach. The mystics focused on magical techniques to manipulate the angels, demons, or spirits (*ruḥaniyyot, pneumata*) believed to inhabit certain planets and stars or to permeate the air. These techniques were supposed to "bring down the *pneumata*" and harness dreams to the purpose of attaining spiritual experience. Studies by Shlomo Pines, Moshe Idel, Dov Schwartz, and others have shown that such practices were known among the German Pietists (*ḥasidei Aškenaz*) and kabbalists from the twelfth century onward.[179] These beliefs and rituals were criticized by Jewish philosophers, particularly Maimonides.[180] It is not clear to what degree Jewish philosophers of the Middle Ages accepted earlier theories (especially Avicenna's) that the heavenly bodies had souls that transmitted occult knowledge to human beings. Those who did believe in such communication often adduced physical causes and mechanisms (light, invisible powers, etc.)

[173] Naṣr Ibn Yaʿqūb al-Dīnawarī, *Kitāb al-qādirī fī al-taʿbīr*, ed. Fahmi Saʿd (Beirut: ʿAlam al-Kutub, 1997), Vol. 1, pp. 91–112, 501 (and index); Kahana-Smilansky, "Science of Dreams," pp. 182, 238–9 nn. 13–16; Mavroudi, *A Byzantine Book*, p. 5 n. 20.

[174] Saadia Gaon, *The Translation and Commentary of the Book of Daniel*, ed. Joseph Kafeḥ (Jerusalem: Ha-Vaʿad le-Hoṣaʾat Sifrei Rasag, 1981), pp. 42–4, 100–1, 120–1 (in Hebrew). Greenbaum, *Peruš ha-Torah le-Rav Šemuel ben Ḥofni Gaʾon*, pp. 112–17. Al-Qirqisani (*Anwār*, p. 600, Section 3) mentions that he discussed dream theory in his commentary on the Torah, but this part of his commentary is not extant. Cf. Frank, *Search Scripture Well*, p. 99 n. 25.

[175] Kahana-Smilansky, "Science of Dreams," pp. 11–12, 133ff.

[176] Greenbaum, *Peruš ha-Torah le-Rav Šemuel ben Ḥofni Gaʾon*, pp. 43–9, 76ff.; idem, "Dream Interpretation," pp. 192–3; Frank, *Search Scripture Well*, pp. 95–7.

[177] *ʾOṣar Ṭov* (supercommentary on Ibn Ezra's Commentary on the Torah), MS Vatican, Biblioteca Apostolica 249/3 (IMHN 313), 313, f. 53b, 14–16.

[178] *Abraham Maimonides' Commentaries on Genesis and Exodus*, ed. Ephrayim J. Weisenberg (London: Suleyman David Sasoon, 1958), index (in Hebrew); Greenbaum, *Peruš ha-Torah le-Rav Šemuel ben Ḥofni Gaʾon*, pp. 43–5.

[179] Shlomo Pines, "The Term *Ruḥaniyyat*, Its Sources, and Judah Halevi's Doctrine," *Tarbiz* 57 (1988): 511–40 (in Hebrew). Moshe Idel, "Astral Dreams," in Shulman and Stroumsa, eds., *Dream Cultures*, chapter 12, pp. 235–51; idem, *Nocturnal Kabbalists*; idem, "Astral-Magical Pneumatic Anthropoids in Fourteenth-Century Spain and Fifteenth-Century Italy," *Accademia* 3 (2001): 95–112. Dov Schwartz, *Studies on Astral Magic in Medieval Jewish Thought* (Leiden: Brill, 2005). Avriel Bar-Levav, "Magic in the Ethical Literature," *Tarbiz* 72 (2002/3): 389–414.

[180] *Guide* Part III, chapter 29 (pp. 514–22); Part III, chapter 45 (pp. 745ff.); Part III, chapter 46 (pp. 581ff.); Part I, chapter 63 (pp. 153ff.); Dov Schwartz, *Astral Magic*, 29ff., 120ff., 126ff. See Michael Schwarz's notes in his translation of the *Guide*, Vol. 1, pp. 162–3; Vol. 2, pp. 523, 603, 615–16.

to explain it.[181] The attitude toward such phenomena could be complex; recent studies on Gersonides, for example, have shown that his commitment to a naturalistic study of dreams and foreknowledge was reflected in both his astral theory and his experiments with magic.[182]

CONCLUSION

This survey began from the hypothesis that, in the Middle Ages, the study of sleep and dreaming was one of the main topics of psychological inquiry. Medieval Jewish scholars who read Arabic could draw on the entire corpus of medical and philosophical literature in that language. This literature seems to be the main source of psychological theory until the middle of the thirteenth century, when the movement to translate philosophical and medical works into Hebrew opened the discussion to the broader Jewish public in Europe. We can point to a number of Arabic medical works that influenced Jewish writers directly. The (allegedly spurious) Galenic *On Sleep and Wakefulness (and Emaciation)*, in Arabic translation, and Ibn Lūqā's *Difference between the Soul and the Spirit*, both from the end of the ninth century, were known to Maimonides. Judging by a passage quoted by Moses Ibn Ezra, an Arabic translation of Galen's *On Diagnosis through Dreams* was also available in Spain in the early twelfth century. The medical literature promoted the brain-centered psychology of Galen, which located the mental functions in different chambers of the brain. The medical works that included chapters on this physiological psychology, such as *Forgetfulness* by Ibn al-Jazzār, Ibn Lūqā's *Soul and Spirit*, Abū Bakr al-Rāzī's *al-Manṣūrī*, Avicenna's *Canon*, works on melancholy, and many others, were translated into Hebrew during the thirteenth century, making medical discussions of sleep, dreams, and nightmares, in the context of sleep disturbances and mental illnesses, available to Hebrew readers.

Jewish writers often accounted for dreaming and foreknowledge in al-Farabi's or Avicenna's psychological terms, but the routes of transmission of these systems, from the tenth to the twelfth century, are hard to identify. The reception of the Arabic Pseudo-Aristotelian *PN* by Jewish scholars requires investigation. Avicenna's specific concepts of intuitive and integrating faculties were known at least in part to Halevi and Maimonides and directly influenced Abū al-Barakāt, Ibn Daud, and Shem-Ṭov Ibn Falaquera, but the scope and manner in which Jewish scholars utilized Avicenna's psychology are not clear. From the middle of the thirteenth century, however, psychological theories of dreams became widely available in the Hebrew translations of Averroes' *Epitome of the PN* and Solomon Melguiri's translation of *Aristotle on Sleep and Wakefulness*. Melguiri's treatise presents a mixed Aristotelian-Galenic psychology and different naturalistic explanations for the origin of dreams and prescience in dreams. In later discussions these works were critically studied by Jewish thinkers alongside

[181] For such physical explanations, see Gad Freudenthal, "Providence, Astrology, and Celestial Influences on the Sublunar World in Shem-Ṭov Ibn Falaquera's *Deʿot ha-Filosofim*," in Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 335–70; Gad Freudenthal, "L'héritage de la physique stoïcienne danse la pensée juive médiévale (Saadya Ga'on, *les dévots rhénans, Sefer ha-Maskil*)," *Revue de métaphysique et de morale* (1998): 453–77. According to Dov Schwartz, many rationalist Jewish thinkers from the twelfth to the end of the fifteenth century "adopted both world views – the Aristotelian approach and the realm of experience (astrology, magic, *segullot*) – simultaneously" (*Astral Magic*, p. 233).

[182] For Gersonides' theory of dreams and divination, the reader is referred to the following studies in Menachem Kellner's two bibliographies: (a) "Bibliographia Gersonideana," in Gad Freudenthal, ed., *Studies on Gersonides: A Fourteenth Century Jewish Philosopher-Scientist* (Leiden: Brill, 1992), pp. 367–414, Section I.B, No. 6 (Alexander Altmann); Section II.iii, No. 1 (Jesse S. Mashbaum); Section VI, No. 67 (Colette Sirat); Section VI, No. 72 (Charles Touati); Section VI, Nos. 65 and 66 (David Silverman); Section VI, No. 39 (Howard Kreisel); Section VI, No. 41 (Daniel Lasker); Section VI, No. 54 (Tamar Rudavsky); Section VI, No. 5 (Idit Dobbs-Weinstein); Section VII, No. 5 (Gad Freudenthal); and (b) "Bibliographia Gersonideana: 1992–2002," *Aleph* 3 (2003): 343–74, on p. 359 (Sara Klein-Braslavy, 1998); on p. 361 (Steven Nadler, 2001).

Maimonides' *Guide* and the Islamic philosophers. Investigation of the Jewish discussions of the concepts of "intuition" and the integration of knowledge (like Maimonides' *šuʿūr*) in the contexts of logic and psychology (not only prophecy) is a desideratum. Concerning the notion that foreknowledge derives from the synthesis of information in sleep, thinkers who quote the Arabic *PN*, Isaac Israeli, Melguiri, or Gersonides' commentary on Averroes' *Epitome of the PN* may have been aware of this alternative to theological divination.

The classification and the discussion of the subject of sleep and dreams in the philosophical encyclopedias attest to the study of this subject from a psychological rather than a theological standpoint. From the twelfth century onward, Hebrew encyclopedias usually classified psychology and dreaming according to the Aristotelian system of Avicenna and regarded these subjects as belonging to the natural sciences.

Compared with medieval Islamic philosophers and traditionalists, who dedicated hundreds of treatises to dreams and their interpretation, Jewish philosophers were less inclined to discuss these subjects. No Jewish author before the sixteenth century is known to have dedicated a book specifically to the subject. This tendency may be related to the deep suspicion about the effects of the imagination, shared by several twelfth-century Jewish philosophers. More research is called for into the social factors and possible theoretical tendencies underlying this attitude.

14

Toward a History of Hebrew Astrological Literature

A Bibliographical Survey

Reimund Leicht

It is only recently that astrology as an inseparable part of Jewish culture and thought throughout the Middle Ages has become a respectable issue in Jewish studies. If, in the past, few scholars focused on the connection between Jewish thought and astrology,[1] today the significant role of astrology in the intellectual world of medieval Judaism is increasingly recognized.

The widespread interest in astrological issues, which can be traced back to the Talmud,[2] becomes unmistakable as early as the tenth century, in the response to it by figures such as Sherira Gaon (ca. 906–1006) and Hai Gaon (939–1038), who commented on various issues related to the belief in astral powers.[3] Astrology was also important enough to come under heavy attack by illustrious intellectual leaders: The refutation of astrology by Saadia Gaon (882–942)[4] undoubtedly should be interpreted in the broader context of the contemporary philosophical and theological discourse and of Karaite attacks on astrology in general and on Rabbanite astrology and magic in particular,[5] but it also testifies to the spread of astrological

[1] See, e.g., Alexander Altmann, "Astrology," *Encyclopaedia Judaica* 3 (1972): 788–95; Ron Barkai, "L'astrologie juive médiévale: aspects théorétiques et pratiques," *Le Moyen Age* 93 (1987): 323–48; Jacques Halbronn, *Le Monde juif et l'astrologie. Histoire d'un vieux couple* (Milan: Archè, 1985). Note that the following manuscript abbreviations are used in the footnotes: BNF, Bibliothèque Nationale de France; IMHM, Institute for Microfilmed Hebrew Manuscripts; JTS, Jewish Theological Seminary; UL, University Library.

[2] Cf. Reimund Leicht, "The Planets, the Jews, and the Beginnings of Jewish Astrology," in S. Shaked, G. Bohak, and Y. Harari, eds., *Continuity and Innovation in the Magical Tradition* (Leiden: Brill, forthcoming).

[3] Cf. the responsa by Hai and Sherira Gaon, in A. E. Harkavy, ed., *Zikron kamah ge'onim* (Berlin, 1887), pp. 206–8. The belief in the astrological influence of the *tequfot* and the prohibition against drinking water on them is discussed in a responsum of Hai Gaon's in *Ḥemdah genuzah*, ed. Z. Wolfensohn (Jerusalem: Y. Back, 1863), f. 29v; on this text see Israel Ta-Shma, "The Danger of Drinking Water during the *Tequfah*: The History of an Idea," *Jerusalem Studies in Jewish Folklore* 17 (1995): 21–32, on pp. 21–2 (in Hebrew), with references to earlier studies. This belief was also known to Muslim scholars like al-Bīrūnī (973–1048); cf. Bernard R. Goldstein, "Astronomy and the Jewish Community in Early Islam," *Aleph* 1 (2001): 17–57, on p. 28.

[4] See Haggai Ben-Shammai, "Saadia's Introduction to Daniel: Prophetic Calculation of the End of Days vs. Astrological and Magical Speculation," *Aleph* 4 (2004): 11–87.

[5] Cf. the texts published by Jacob Mann in the appendices to "The Karaite Settlement in Palestine (Till the First Crusade)," in idem, *Texts and Studies in Jewish Literature* (Philadelphia: Jewish Publication Society, 1931/5), Vol. 2, pp. 3–127; Ben-Shammai, "Saadia's Introduction," pp. 28–31.

This article is based on research that I carried out in Jerusalem as a fellow of the Minerva Foundation (Munich) in 2005–7 and at Scholion, the Interdisciplinary Center for Jewish Studies at the Hebrew University, in 2007–8. The excellent working conditions and the warm personal atmosphere there made this period into one of the most pleasant of my academic career. I must also thank Gad Freudenthal for numerous helpful remarks on previous drafts of this chapter.

thinking in Jewish circles at the end of the first millennium. It is noteworthy that Saadia's opinion about astrology was far from uniform. Despite his criticism, he included astrological ideas in his commentary on *Sefer Yeṣirah* (Book of Creation).[6] Similarly, his North African contemporary Dunash Ibn Tamim of Kairouan (ca. 885–after 955) seems to subscribe to the principles of astrology in a commentary on Genesis; however, he also devoted an entire treatise in Arabic to *The Fragility of the Principles of Judicial Astrology* (*Fī daʿf al-uṣūl fī aḥkām an-nuǧūm*).[7]

A century later, the long astronomical–astrological section in *Keter malkut* (Royal Crown), the famous poem by Solomon Ibn Gabirol (1021–1070), can – *cum grano salis* – be considered the first attempt to formulate astrological teachings in the Hebrew language in medieval Spain.[8] Abraham Bar Ḥiyya (ca. 1065–1140),[9] Judah Halevi (1075–1141),[10] and Abraham Ibn Ezra (1089–1164)[11] are other outstanding examples of medieval Jewish authors who wrote on astrology, astral magic, or both. Most famously, Moses Maimonides (1137/8–1204) rejected not only magical and medical practices based upon astrology ("astral magic") but also judicial astrology, with its belief that the planets exert an influence on the events of human life and that future events can be predicted by means of astrological rules.[12]

In the later Middle Ages, astrological motifs heavily influenced kabbalah;[13] astral magic as a distinct branch of astrology was a central aspect of the rise of Jewish Neoplatonism in the

[6] Cf. Goldstein, "Astronomy and the Jewish Community," pp. 39–42 and 50–4.

[7] Cf. *Le Commentaire sur le Livre de la Création de Dūnaš ben Tāmīm de Kairouan (Xe siècle)*, ed. Georges Vajda, rev. and enlarged Paul B. Fenton (Louvain: Peeters, 2002), pp. 7–8 and 67–8.

[8] Solomon Ibn Gabirol, *Keter malkut*, ed. Israel Levin (Tel Aviv: Tel Aviv University Press, 2006), chapters 11–22, with commentary on pp. 50–86. Cf. also Goldstein, "Astronomy and the Jewish Community," p. 42.

[9] Cf. Moritz Steinschneider, "Apocalypsen mit polemischer Tendenz," *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 28 (1874): 627–59, on p. 633; Julius Guttmann, "Über Abraham Bar Chijja's 'Buch der Enthüllung,'" *Monatsschrift für Geschichte und Wissenschaft des Judentums* 47 (1903): 446–69 and 545–69, on pp. 558–69; Shlomo Sela, "Abraham Bar Ḥiyya's Work and Thought," *Jewish Studies Quarterly* 13 (2006): 128–58; J. Rodríguez-Arribas, "Historical Horoscopes of Israel: Abraham bar Ḥiyya, Abraham ibn Ezra and Yosef ben Eliezer," in G. Oestmann, H. D. Rutkin, and K. von Stuckrad, eds., *Horoscopes and Public Spheres: Essays on the History of Astrology* (Berlin: de Gruyter, 2006), pp. 145–64 on pp. 145–9.

[10] Cf. Dov Schwartz, *Astral Magic in Medieval Jewish Thought* (Ramat Gan: Bar-Ilan University Press, 1999), pp. 31–61 (in Hebrew); Shlomo Pines, "On the Term Ruḥaniyyot and its Origin and on Judah Halevi's Doctrine," *Tarbiz* 57 (1988): 511–40 (in Hebrew).

[11] Cf. Y. Tzvi Langermann, "Some Astrological Themes in the Thought of Abraham Ibn Ezra," in Isadore Twersky and Jay M. Harris, eds., *Rabbi Abraham Ibn Ezra: Studies in the Writings of a Twelfth-Century Jewish Polymath* (Cambridge, MA: Harvard University Press, 1993), pp. 28–85; Shlomo Sela, *Astrology and Biblical Exegesis in Abraham Ibn Ezra's Thought* (Ramat Gan: Bar-Ilan University Press, 1999; in Hebrew); Raphael Jospe, "Torah and Astrology," *Daʿat* 32–33 (1994): 31–52 (in Hebrew); idem, "Torah and Astrology," in *Proceedings of the Eleventh World Congress of Jewish Studies*, Division C (Jerusalem: World Union of Jewish Studies, 1994), Vol. 2, pp. 17–24; Shaul Regev, "*Ha-simboliqah šel maʿaśeh ha-miškan be-ferušo šel R. Avraham Ibn Ezra*," *Sinai* 112 (1992/3): 250–62 (in Hebrew).

[12] Alexander Marx, "The Correspondence between the Rabbis of Southern France and Maimonides about Astrology," *Hebrew Union College Annual* 3 (1926): 312–58; Howard Ḥayyim Kreisel, "*Gišato šel ha-Rambam le-Asṭrologiah*," *Proceedings of the Eleventh World Congress of Jewish Studies*, Division C (Jerusalem: World Union of Jewish Studies, 1994), Vol. 2, pp. 25–32 (in Hebrew); Gad Freudenthal, "Maimonides' Stance on Astrology in Context: Cosmology, Physics, Medicine, and Providence," in F. Rosner and S. Kottek, eds., *Moses Maimonides: Physician, Scientist, and Philosopher* (Northvale, NJ: Jason Aronson, 1993), pp. 77–90; repr. in Gad Freudenthal, *Science in the Medieval Hebrew and Arabic Traditions* (Aldershot: Ashgate, 2005); Y. Tzvi Langermann, "Maimonides' Repudiation of Astrology," *Maimonidean Studies* 2 (1991): 123–58; Shlomo Sela, "The Fuzzy Borders between Astronomy and Astrology in the Thought and Work of Three Twelfth-Century Jewish Intellectuals," *Aleph* 1 (2001): 59–100, on pp. 63–80.

[13] For a general survey, see Ronald Kiener, "The Status of Astrology in the Early Kabbalah: From the *Sefer Yeṣirah* to the Zohar," *Jerusalem Studies in Jewish Thought* 6 (1987): 1–42; Schwartz, *Astral Magic*, pp. 125–44, idem, "From

fourteenth century.[14] Evidence of lively discussions on astrology, in both scholarly circles and larger parts of Jewish communities, can be found in medieval homiletic literature, rabbinic responsa,[15] and many ethical and literary works.[16]

What, however, is the connection between this steady *interest* in astrology and the *production* of astrological literature by Jewish scholars? Was there a direct correlation between the scholarly debates on astrology and the production, reception, and diffusion of astrological texts in medieval Jewish culture? Although the history of Jewish astrological literature as a history of authors, texts, and readers has yet to be written, in the present article, I seek to draw a preliminary map of how much Hebrew astrological literature was indeed produced, transmitted, and read during the Middle Ages.

The main body of evidence and the basis for my inquiry will be astrological manuscripts (and a few early printed books). Manuscripts testify to the interest of their scribes or readers in astrology, but this evidence must be juxtaposed with information on Hebrew astrological literature culled from literary sources. The results may be surprising: Although almost every medieval Jewish author, from the tenth century on, had something to say about astrology, direct references to the existence of astrological literature in Hebrew are strikingly scarce and comparatively late in date. A few precursors notwithstanding, the large-scale production, transmission, and reception of Hebrew astrological literature does not antedate the fourteenth century – long after the early religious discourse *about* astrology. In all likelihood, astrological literature was never studied in any institutionalized Jewish educational framework. Thus astrology seems to have been a major issue of theological, philosophical, and halakhic discussions long before mechanisms for the production and transmission of astrological knowledge in Hebrew crystallized. This raises the question of whether the theological and philosophical disputes about astrology were triggered by real acquaintance with this discipline or whether the sequence was just the opposite, namely that theoretical speculations about astrology triggered the production and transmission of astrological texts in Hebrew.

Theurgy to Magic: The Evolution of the Magical-Talismanic Justification of Sacrifice in the Circle of Naḥmanides and his Interpreters," *Aleph* 1 (2001): 165–213.

14 Cf. Moshe Idel, "Hermeticism and Judaism," in I. Merkel and A. G. Debus, eds., *Hermeticism and the Renaissance: Intellectual History and the Occult in Early Modern Europe* (Washington, D.C.: Folger Shakespeare Library, 1988), pp. 59–76, on pp. 62–6. See also Dov Schwartz, "The Religious Philosophy of Samuel Ibn Zarza," Ph.D. dissertation, Bar-Ilan University, 1989 (in Hebrew); idem, *The Philosophy of a Fourteenth-Century Jewish Neoplatonic Circle* (Jerusalem: Mosad Bialik, 1996; in Hebrew); idem, *Astral Magic*; idem, "Conceptions of Astral Magic within Jewish Rationalism in the Byzantine Empire," *Aleph* 3 (2003): 165–211; idem, *Amulets, Properties and Rationalism in Medieval Jewish Thought* (Ramat Gan: Bar-Ilan University Press, 2004; in Hebrew); idem, *Studies on Astral Magic in Medieval Jewish Thought* (Leiden: Brill, 2004).

15 See, e.g., Solomon ben Adret, *Šeʾelot u-tešuvot* (Jerusalem: Makhon Yerushalayim, 1997–2005), Part 1, Nos. 19, 148, 167, 409, 413, and 825; Part 5, No. 48; attributed responsum No. 287; idem, *Tešuvot ha-Rašba*, ed. Ḥayyim Dimitrovski (Jerusalem: Mosad ha-Rav Kook, 1990), pp. 260–348; Asher ben Jeḥiel, *Šeʾelot u-tešuvot* (Jerusalem: Makhon Yerushalayim, 1994), No. 53, p. 8; Judah ben Asher, *Zikron Yehudah* (Jerusalem: Makhon Yerushalayim, 2005), No. 91, pp. 227–8; Simeon ben Ṣemaḥ Duran, *Tešuvot* (Jerusalem: Makhon Yerushalayim, 1998–2002): Part 1, No. 106; Part 2, No. 1; Nissim ben Reuben Gerondi, *Derašot*, ed. M. L. Katzenellenbogen (Jerusalem: Mosad ha-Rav Kook, 2003), pp. 326–31 (No. 8) and 447–51 (No. 11).

16 *Sefer Ḥasidim*, 2nd ed., ed. J. Wistinetzki (Frankfurt: M. A. Wahrmann, 1924), Sections 33, 880, 989, 1447, 1453, and 1516; Asher ben Jeḥiel, "Commentary on '*En Mazzal le-Yisraʾel*,'" in Baḥya Ibn Paqudah, *Sefer Torat ḥovot ha-levavot* (Warsaw, 1875), p. 256; cf. Abraham H. Freimann, *Ha-Roš: Rabbenu Asher b"r Yeḥiʾel we-ṣeʾeṣaw* (Jerusalem: Mosad ha-Rav Kook, 1986), p. 84 (in Hebrew); Menaḥem ben Zeraḥ, *Ṣedah la-derek* (Warsaw, 1880): ff. 62v–63v; Judah al-Ḥarizi, *Sefer Taḥkemoni*, ed. Y. Toporowski (Tel Aviv: Maḥbarot le-Sifrut and Mosad ha-Rav Kook, 1952), pp. 213–17 (chapter 22) and 356 (chapter 46). See also Joseph Yahalom and Joshua Blau, *The Wanderings of Judah Alharizi: Five Accounts of his Travels* (Jerusalem: Ben-Zvi Institute, 2002), p. 65.

THE ASTROLOGICAL LEGACY OF LATE ANTIQUITY

The quantitative dimensions of the production of astrological literature by Jews in antiquity, up to the end of the Second Temple period, cannot be satisfactorily determined.[17] Even though several astrological fragments from Qumran and a few other Jewish astrological texts of this period prove that Jews read and wrote astrological literature in Hebrew, Greek, and Aramaic in the Hellenistic and Roman ages, our knowledge thereof remains scanty. The striking paucity of evidence, however, leaves the impression that the Second Temple Jewish astrological library was probably never very extensive. Moreover, whatever may have once existed, almost nothing of it had a traceable afterlife in Late Antiquity and the Middle Ages.

Might it be appropriate, then, to start our outline of Hebrew astrological literature almost a millennium later, in the Early Middle Ages, with Shabbetai Donnolo (913–after 982), who wrote on astrological issues in *Sefer Ḥak̲moni*, his Hebrew commentary on *Sefer Yeṣirah*, composed in southern Italy? Significantly, in his introduction he complains bitterly that astrology was not taught by his fellow Jewish scholars.[18]

This would be a rash act. Donnolo was undoubtedly a pioneer in evincing scientific interest in the study of astrology,[19] but we must not overestimate his historical role, because his writings also prove that he was not the first Jew to write about astrology. He was rather the first (and last!) medieval Jewish author who made a serious attempt to collect earlier Hebrew works on astrology, with the goal of commenting on them in the light of Arabic, Greek, Indian, and Babylonian astrology, which he had studied with his anonymous non-Jewish teacher.[20] One of Donnolo's traceable Hebrew predecessors, other than *Sefer Yeṣirah*, which is replete with astrological motifs but cannot be called an astrological text, is the *Baraita di-Šemu'el*. This work was printed in the nineteenth century from a single, defective manuscript, which seems to be lost today.[21] Consequently, little can be said about the diffusion of this highly enigmatic text,[22] which owes its survival – at least as a title – in the Middle Ages[23] largely to Donnolo's mention of it and to its being occasionally confused with the *Baraita de-Mazzalot*.[24]

It is possible but not certain that the latter text, called *Baraita de-Mazzalot* by S. A. Wertheimer, its first editor, was indeed written by Donnolo, to whom it has been repeatedly ascribed in modern scholarship.[25] Recent studies indicate that this anonymous tract, preserved without a title in a fragment from the Cairo Geniza and in at least four Italian

[17] Cf. Reimund Leicht, *Astrologumena Judaica: Untersuchungen zur Geschichte der astrologischen Literatur der Juden* (Tübingen: Mohr Siebeck, 2006), pp. 9–38.

[18] Shabbetai Donnolo, *Peruš Sefer Yeṣirah*, ed. D. Castelli (Florence, 1880), pp. 4–5.

[19] On Shabbetai Donnolo see also Andrew Sharf, *The Universe of Shabbetai Donnolo* (Warminster: Aris and Phillips, 1976); Piergabriele Mancuso, "Shabbatai Donnolo's *Sefer Hakmoni*: A Critical Edition and English Translation," Ph.D. dissertation, University College, London, 2006; Sacha Stern and Piergabriele Mancuso, "An Astrological Table by Shabbetai Donnolo and the Jewish Calendar in Tenth-Century Italy," *Aleph* 7 (2007): 13–41.

[20] Donnolo, *Peruš Sefer Yeṣirah*, p. 5.

[21] *Baraita di-Šemu'el ha-Qaṭan*, ed. Nathan Amram (Saloniki, 1861). The most popular edition is in J. D. Eisenstein, *'Oṣar midrašim* (New York: Reznick, Menschel and Co., 1928), Vol. 2, pp. 542–7 (in Hebrew).

[22] Cf. Leicht, *Astrologumena Judaica*, pp. 82–9.

[23] In Spain, the *baraitot* were known to Abraham Bar Ḥiyya: *Megillat ha-megalleh*, ed. A. Poznanski and J. Guttmann (Berlin: Mekiṣe Nirdamim, 1924), chapter 5; idem, *'Iggeret Avraham Bar Ḥiyya ha-nasi' še-katav le-R. Yehudah b"R. Barzillai 'al še'elah ba-kaldiyyim*, ed. Z. Schwarz, in S. Krauss, ed., *Festschrift Adolf Schwarz zum siebzigsten Geburtstage* (Vienna: R. Löwit, 1917), pp. 23–26. They were also known to Abraham's opponent Yehudah Barzillai, *Peruš Sefer Yeṣirah*, ed. S. J. Halberstam (Berlin, 1885), p. 259.

[24] This confusion has also affected the textual transmission of the *Baraita di-Šemu'el*. As Gad Ben-Ami Sarfatti has shown in "Mavo' la-Baraita de-Mazzalot," *Annual of Bar-Ilan University: Studies in Judaism and the Humanities* 3 (1965): 56–82, on pp. 73–5, large parts of the printed version originally belong to the *Baraita de-Mazzalot*; cf. also Leicht, *Astrologumena Judaica*, pp. 82–4.

[25] Sarfatti, "Mavo' la-Baraita de-Mazzalot," pp. 78–82; Leicht, *Astrologumena Judaica*, pp. 85–8.

manuscripts of the fifteenth century,[26] and parts of which were translated into Latin no later than the end of the tenth century, could well be the work of another Jewish author who worked in the second half of the first millennium.[27]

In any event, the existence of this and other astrological texts, such as the astrological sections of *Pirqei de-Rabbi Eliezer* (chapters 6–8), provides clear evidence that medieval Hebrew astrological literature was not a total creation ex nihilo of the tenth century. This should be borne in mind, even if Moritz Steinschneider's observation about the strikingly late origins of Jewish astrological literature and its dependence on Arabic remains basically correct.[28]

In addition to the astrological traditions found in various works of Hebrew literature, a hitherto unrecognized corpus of astrological texts originating in Palestinian Judaism of the later Roman and Byzantine periods has come down to us. More than a dozen Hebrew and Aramaic astrological fragments from the Cairo Geniza, written between the tenth and the thirteenth centuries, probably preserve ancient Palestinian traditions.[29] They contain mainly short texts of "popular" astrology generally labeled "almanacs," such as the *Treatise of Shem*, the *Revelation of Ezra*, astrological dicta attributed to Jannes and Jambres, selenodromia, and hemerologia. Not a single item among the astrological fragments from the Geniza displays any familiarity with the teachings of the scientific astrological literature of Late Antiquity; even a short list based on Ptolemy's attribution of certain geographical regions to different signs of the zodiac appears to have become an element of popular rather than learned astrology.[30]

Dating texts of "popular" astrology, including those from the Geniza, is notoriously difficult, but at this point a linguistic argument may be helpful: More than half of the relevant texts are written in good Palestinian Aramaic. Because the use of this dialect was rather limited in space and time, we can conclude that most of these Aramaic texts, which all seem to be translations from Greek sources, were produced in Palestine during the Byzantine period or soon after the Islamic conquest (sixth/seventh–tenth centuries). This corpus of texts clearly deserves a detailed study.[31]

As far as we can learn from the manuscripts preserved in the Cairo Geniza, the twelfth and thirteenth centuries were a watershed in the history of the ancient Palestinian astrological legacy.[32] The available evidence shows that, during the twelfth century, Aramaic astrological texts were being translated into Hebrew and Arabic, obviously because knowledge of Aramaic was on the wane. At least from the thirteenth century onward, almost all the Aramaic texts disappeared, together with their Judeo-Arabic translations, and new Arabic texts began

[26] New York, JTS, Mic. 4931 (Geniza, 12 c.) [IMHM F 49782]; Oxford, Bodleian Library, Reggio 42 (Neubauer 2244), f. 3 (Italy, 15 c.) [IMHM F 20527]; Basel, Universitätsbibliothek, R IV 2, ff. 30v–34r (Ashkenaz/Italy, 15 c.) [IMHM F 2573]; Oxford, Bodleian Library, Opp. 588 (Neubauer 1345), ff. 231r19–231v29 (Italy, 15/16 c.) [IMHM F 22371]; Florence, Biblioteca Medicea Laurenziana, Plut. 88.55, f. 92r20–25 (Italy, 15/16 c.) [IMHM F 44229]. A short quotation can be found in the Geniza fragment Cambridge, UL, T-S NS 309.51, f. 1r [IMHM F 32998].

[27] Leicht, *Astrologumena Judaica*, pp. 87–8. The Latin texts were recently published by David Juste, *Les Alchandreana primitifs. Etude sur les plus anciens traités astrologiques latins d'origine arabe (X^e siècle)* (Leiden: Brill, 2007).

[28] Moritz Steinschneider, *Die Mathematik bei den Juden* (Berlin and Leipzig, 1893–9; Frankfurt 1901; repr. Hildesheim: Georg Olms, 1964), p. 46: "Wir haben bei dieser astronomisch-astrologischen Einschaltung in ein homiletisches Buch [i.e., *Pirqei de-Rabbi Eliʿezer*] länger verweilt, als seine eigene Bedeutung verdient hätte; es galt nachzuweisen, dass die Astrologie bei den Juden nicht an alte Traditionen knüpfen und hebräische Monographien hervorrufen konnte, vielmehr aus den Schulen der Araber auf die Juden überging und schon in namhaften arabischen Werken vertreten war, als sie sich in die theologischen hebräischen einschlich."

[29] For a comprehensive description and analysis of this material see Leicht, *Astrologumena Judaica*, pp. 45–82.

[30] Cf. ibid., pp. 71–3.

[31] I am currently preparing a comprehensive edition of these texts.

[32] On this point see Reimund Leicht, "Some Observations on the Diffusion of Jewish Magical Texts from Late Antiquity and the Early Middle Ages in Manuscripts from the Cairo Genizah and Ashkenaz," in S. Shaked, ed., *Officina Magica: Essays on the Practice of Magic in Antiquity* (Leiden: Brill, 2005), pp. 213–31, on pp. 228–9.

replacing the older Aramaic traditions. There is no evidence of the large-scale survival of popular astrological literature of Palestinian Aramaic origin in the Orient after the thirteenth or fourteenth century.

THE SURVIVAL OF PALESTINIAN JEWISH ASTROLOGICAL TRADITIONS IN ASHKENAZ AND THE BEGINNINGS OF ASTROLOGICAL LITERATURE IN NORTHERN EUROPE

In spite of its disappearance in the Orient, the Palestinian Jewish astrological legacy did not vanish completely. Through channels that still have to be clarified, much of the Aramaic astrological material reflected in the Cairo Geniza reached medieval Germany, France, and Italy. In Jewish culture in medieval Europe, astrological traditions were transmitted in liturgical manuscripts, which became an important cultural context for astrological lore. It is unknown whether the practice of adding astrological works to prayer books had any precedents in the Orient, but we find appendices with popular astrological and divinatory texts in Ashkenazi maḥzorim and siddurim as early as the twelfth century. [33] Two of the earliest manuscripts (twelfth century and mid-thirteenth century) are of the famous *Maḥzor Vitry*.[34] At the end of the thirteenth century, these appendices were still being copied in other Ashkenazi maḥzor manuscripts.[35] From the fourteenth century on, lengthy collections of astrological and other divinatory texts were a standard element of liturgical manuscripts in Italy.[36] Because much of the astrological material in medieval prayer books can be traced back to Palestinian texts found in the Cairo Geniza, it seems likely that at least some of the texts attested exclusively in medieval liturgical manuscripts may have originated in late classical Palestine, too, whereas only a few texts were clearly adopted from medieval European Latin or vernacular sources.

Prayer books were not the only context in which ancient astrological texts had a place in medieval Jewish culture. A second branch of medieval Ashkenazi transmission of this kind of knowledge consisted of calendrical handbooks (*sifrei ʿevronot*). An important early example of this genre is a manuscript entitled *Sod ha-ʿibbur*, whose last four folios contain a precious collection of minor astrological texts.[37] Well into the eighteenth century, dozens of later Ashkenazi manuscripts and printed books on the Jewish calendar contained astrological material. Texts of popular astrology, which gained the widest diffusion in medieval and early modern German lands, were those that entered calendar works.

The third and most complex branch of transmission of astrological texts in medieval Europe is the mystical and cosmological works associated with the German Pietists (*Ḥasidei Ashkenaz*).[38] We know very little about the astrological library of the first generation of that group.[39] The works of Eleazar of Worms, however, who was the most prolific Ashkenazi author on cosmological issues, are full of excerpts and extensive quotations from earlier works on astrology. Here we find borrowings from books like Donnolo's commentary on *Sefer Yeṣirah*,

33 For a more detailed study of astrology in medieval Ashkenazi culture, see R. Leicht, "The Reception of Astrology in Medieval Ashkenazi Culture," *Aleph* (forthcoming).

34 Sassoon 535 (now Klagsbald, France, 13 c.), pp. 451–3 (pp. 451–2 are an addition by a later scribe), and 595–6 (dream-hemerologion) [IMHM F 9278]; Oxford, Bodleian Library, Opp. 59 (Neubauer 1100), f. 282r–v (Germany, 13 c.) [IMHM F 17706].

35 Oxford, Bodleian Library, Mich. 569 (Neubauer 1098), ff. 97r and 111v (Germany, 1288/9) [IMHM F 17293].

36 Cf. Leicht, *Astrologumena Judaica*, pp. 119–24. One of the last stages in this development is the inclusion of a large collection of astrological contexts in two manuscripts of Moses ben Yequtiel de Rossi's *Sefer ha-Tadir* (1380).

37 Berlin, Staatsbibliothek, Or. oct. 352 (Steinschneider 221), ff. 25v–28r (Ashkenaz, ca. 1300) [IMHM F 2015].

38 Cf. Leicht, *Astrologumena Judaica*, pp. 147–52.

39 *Sefer Ḥasidim* (Section 33) mentions only the *Baraita di-Šemuʾel* and an unidentified *Sefer Mazzalot*.

the *Baraita de-Mazzalot*, and the *Baraita di-Šemuʾel*. Moreover, Eleazar assembled a number of shorter astrological texts in chapter *kaf* of *Sodei razzaya'*,[40] in *Sefer Ḥokmat ha-nefeš*,[41] and in his commentary on *Sefer Yeṣirah*.[42] Additional astrological traditions are preserved in other works and manuscripts from the circles of *Ḥasidei Ashkenaz*, like the recently published *Sefer Gemaṭriot*, which is attributed to Judah the Pious but probably originated with his students. It contains a collection of texts on astrology and physiognomy.[43] An important example of this branch of the Ashkenazi transmission of astrological texts is a section in one Oxford manuscript; it too has a close connection with the activities of the German Pietists.[44]

The corpus of astrological literature attested in these three strands of transmission has yet to be systematically investigated. A first comparison of the manuscripts reveals, however, that differences in details notwithstanding, the liturgical manuscripts, the calendrical handbooks, and the works of *Ḥasidei Ashkenaz* share a common core of astrological texts. Therefore, the literary corpus attested here can be seen as representative of the astrological library of Ashkenazi Judaism.

We know very little about the astrological literature available to Ashkenazi Jews outside these three channels of transmission. Avraham Grossman has shown that Jacob ben Samson composed a book on calendar issues, astronomy, and astrology (1123/4);[45] unfortunately, the fragments he collected from the so-called *Sefer Alqoši* do not allow far-reaching conclusions about its character and astrological contents.[46] The existence of this work, however, proves that Jews in medieval France and Germany were interested in astrology long before the rise of *Ḥasidei Ashkenaz*.

There is almost no evidence for a broader production or reception of "scientific" astrological literature in the Greco-Arabic tradition in northern and western Europe before the late fourteenth to early fifteenth century. Almost all of the Hebrew astrological literature that flourished in Spain and southern France in this period, whether translations or original compositions, remained unnoticed farther north; the only exception was Abraham Bar Ḥiyya's eschatological work *Megillat ha-megalleh*, which is discussed in greater detail in a subsequent section.[47] The absence of evidence for the diffusion of scientific astrological literature is particularly striking in the case of Abraham Ibn Ezra, who lived many years in France, especially in Rouen, and became an authority for Christian scholars.[48] He seems nevertheless to have had surprisingly little impact on Jewish scholars in northern Europe.[49] The only Ashkenazi book

40 *Sodei razzaya'*, ed. S. ha-Kohen Weiss (Jerusalem: Shaare Ziv, 1985), pp. 71–4.

41 *Sefer Ḥokmat ha-nefeš*, ed. M. Shapira (Lemberg, 1876), f. 8r–v, where Eleazar quotes a dream-hemerologion.

42 *Peruš Sefer Yeṣirah*, ed. M. Shapira, *Ha-R"E ʿal Sefer Yeṣirah* (Przemysl, 1883), f. 12r. The appendix (ff. 20c–21d) contains a detailed horologion with the planetary ruler for every hour of the week and predictions for those born in them, a popular horoscope for those born on certain days of the week, and a hemerologion for traveling. The attribution of this appendix to Eleazar of Worms's original work is not sure. It may have been added by a later scribe.

43 See *Sefer Gematriot of R. Judah the Pious: Facsimile Edition of a Unique Manuscript*, ed. D. Abrams and I. Ta-Shma (Los Angeles: Cherub Press, 1998), ff. 25r–29v; and the noncritical edition, *Sefer Gemaṭriot le-ḥad qamay ʿir we-qaddiš Rabbenu Yehudah he-Ḥasid*, ed. Y. Yisrael (Jerusalem: Y. Y. Stall, 2005), pp. 250–68.

44 Oxford, Bodleian Library, Mich. 9 (Neubauer 1531), ff. 108r–114v (Ashkenaz, ca. 1300) [IMHM F 16899].

45 Avraham Grossman, *Early Sages of France: Their Lives, Leadership, and Works*, 3rd ed. (Jerusalem: Magnes Press, 2001), pp. 418–23 (in Hebrew). Cf. also Ephraim Kanarfogel, *"Peering through the Lattices": Mystical, Magical, and Pietistic Dimensions in the Tosafist Period* (Detroit: Wayne State University Press, 2000), p. 158 n. 65.

46 On a clearly folkloristic element in *Sefer Alqoshi* – the ban on drinking water during the equinoxes and solstices (*tequfot*) – see Ta-Shma, "The Danger of Drinking Water," pp. 27–8.

47 See the section on "Other Hebrew Scientific Astrological Literature in the Middle Ages," p. 273.

48 For a recent discussion, with references to earlier studies, see N. Golb, *The Jewish in Medieval Normandy* (Cambridge: Cambridge University Press, 1998), pp. 253–96.

49 It may be mentioned here that two of our major witnesses for Jewish culture and knowledge in Ashkenaz during the thirteenth century, Moses Taku's *Ketav Tamin*, ed. Y. Dan (Jerusalem: Merkaz Zalman Shazar, 1984), and

that evinces some familiarity with Ibn Ezra's astrological terminology is the anonymous *Sefer ha-Ḥayyim*, a mystical book probably composed in northern France around the year 1200.[50]

A considerably later anonymous astrological work from northern Europe – place and date of composition still unknown – is preserved in three manuscripts of the fifteenth century.[51] It reveals some knowledge of Arabic scientific literature and deserves further investigation. Although it is mainly a compilation, its value is that it reflects traditions that seem to be largely independent of the other branches of astrological literature in medieval Ashkenaz and France. The same holds true for the astrological sections in a fifteenth-century manuscript preserved in Oxford.[52]

THE ASTROLOGICAL WORKS OF ABRAHAM IBN EZRA

Abraham Ibn Ezra's works in the field are by far the most influential and important Jewish contribution to astrology. Their Hebrew versions are attested in more than one hundred manuscripts from almost every part of the Diaspora. Moreover, through versions in Old French and Latin, his writings became influential among Christian scholars of the Middle Ages and the Renaissance.

There can be no doubt that Abraham Ibn Ezra's project of writing a comprehensive Hebrew description of astrological doctrines was crowned with success.[53] His astrological oeuvre – a carefully organized outline of the science of astrology – can be seen as the true beginning of the classical period of Hebrew astrology. He drew his information from astrological works in Arabic and based his terminology on the biblical lexicon. He was either unaware of Hebrew predecessors or deliberately ignored them – with the notable exception of Abraham Bar Ḥiyya.[54] In this sense, Abraham Ibn Ezra was a real innovator and not a continuator of older traditions, and he had an enormous impact on later generations.

The Genesis, Transmission, and Diffusion of Abraham Ibn Ezra's Astrological Encyclopedia(s)

The genesis and transmission of Abraham Ibn Ezra's astrological writings is a difficult issue. The first modern scholar to tackle the problem was Moritz Steinschneider. He published a long article on Ibn Ezra[55] and prepared the first comprehensive analysis of his astrological

Abraham ben Azriel, *Sefer ʿArugat ha-bośem*, ed. E. E. Urbach (Jerusalem: Mekiṣe Nirdamim, 1939–63) are totally unaware of Abraham Ibn Ezra's astrological works.

50 Close parallels with Ibn Ezra can be found in G. Necker, *Das Buch des Lebens = Sefer ha-Ḥayim: Edition, Übersetzung und Studien* (Tübingen: Mohr Siebeck, 2001), in the description of the firmament (Section 6) and the astrological terminology (e.g., §39 כוכב הצומח; §91 מזל צומח, מבטים, יתידות); cf. Abraham Ibn Ezra's *Reʾšit ḥok̲mah*, in *The Beginning of Wisdom: An Astrological Treatise by Abraham Ibn Ezra*, ed. R. Levy and F. Cantera (Baltimore: Johns Hopkins Press, 1939), pp. VII, LVIII, et passim.

51 Vatican, Bibliotheca Apostolica, ebr. 477, ff. 29r–40v (Italy, 14 c.) [IMHM F 530] contains the shortest version; Munich, Bayerische Staatsbibliothek, cod. Heb. 73, ff. 150r–158r (Ashkenaz, 16 c.) [IMHM F 1261], and Paris, BNF, héb. 1120, ff. 135r–148v (Ashkenaz, 15 c.) [IMHM F 30897] contain appendixes. A section from one of these appendixes, attributed to Moses ha-Darshan, was published by A. Epstein, *Moses ha-Darschan aus Narbonne. Fragmente seiner literarischen Erzeugnisse nach Druckwerken und mehreren Handschriften* (Vienna, 1891), p. 41.

52 Oxford, Bodleian Library, Opp. 1666 (Neubauer 2079), ff. 22v–26v and 38v–46v (Ashkenaz, 15 c.) [IMHM F 19364].

53 For a survey of Abraham Ibn Ezra's scientific and astrological writings, see Shlomo Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003), pp. 57–78.

54 Cf. Sela, *Astrology and Biblical Exegesis*, pp. 47–8 n. 47 and 114–22.

55 Moritz Steinschneider, "Abraham Ibn Esra (Abraham Judaeus Avenare)," *Supplement zur Zeitschrift für Mathematik und Physik* 25 (1880): 59–128; repr. in *Gesammelte Schriften*, ed. H. Malter and A. Marx (Berlin: M. Poppelauer, 1925; repr. Hildesheim: Georg Olms, 1980), Vol. 1, pp. 407–98, on pp. 496–7.

works. The latter appeared as an appendix to the catalogue of the manuscript collection of what was then the Königliche Bibliothek in Berlin, but unfortunately has been largely overlooked by subsequent scholarship.[56] There Steinschneider established, for the first time, the full corpus of Ibn Ezra's astrological works – an "encyclopedia" of eight books covering all aspects of the science. In spite of minor corrections, Steinschneider's conclusions still constitute the basis for contemporary scholars.[57] He was also aware of the existence of different versions and Latin translations of several of these texts and can be seen as the father of the theory that Abraham Ibn Ezra composed two separate versions of his astrological works.

Studies of Ibn Ezra's astrology were carried forward much later by scholars like Raphael Levy,[58] N. Ben-Menaḥem,[59] and J. L. Fleischer,[60] to whom we also owe a number of editions of these texts. More recently, Shlomo Sela has devoted intensive research to the reconstruction of Ibn Ezra's Hebrew astrological works; he basically takes the "two-version theory" for granted.[61]

R. Smithuis, however, has reopened the discussion. In a recently published article, she identified formerly unknown Latin translations of several of Ibn Ezra's astrological works (the *Liber nativitatum*, *Liber revolucionum*, *Liber eleccionum*, and *Liber interrogacionum*) and argued that they go back to lost Hebrew originals. She consequently suggests that Ibn Ezra actually wrote three versions of his astrological encyclopedia[62] and that the two-version theory must not be taken as established.[63]

These recent developments notwithstanding, scholars generally agree that Ibn Ezra wrote his main work on astrology – *Sefer Reʾšit ḥokmah* (Beginning of Wisdom) – in Béziers in southern France in 1148, to which he added the first versions of the *Ṭeʿamim* (Reasons) and *Sefer ha-ʿOlam* (Book of the World).[64] Cross-references make it very likely that the first versions of *Sefer ha-Moladot* (Book of Nativities) and of *Sefer ha-Mivḥarim* (Book of Elections) were also composed in the same year.

But did Abraham Ibn Ezra write a complete encyclopedia then? The assumption that the other parts of the astrological "encyclopedia" – that is, the extant *Sefer ha-Šeʾelot* (Book of Interrogations) and the first version of *Sefer ha-Meʾorot* (Book of the Luminaries) – were written concomitantly is quite plausible but nevertheless partly based on conjecture.[65] The manuscripts of *Sefer ha-Meʾorot* do not indicate a year of composition, whereas the earliest

[56] Moritz Steinschneider, *Die Handschriften-Verzeichnisse der Königlichen Bibliothek zu Berlin: Verzeichnis der Hebraeischen Handschriften* (Berlin: Buchdruckerei der Königlichen Akademie der Wissenschaften [G. Voigt], 1897), pp. 136–50.

[57] Steinschneider, *Die Handschriften-Verzeichnisse Berlin*, Vol. 2, p. 138, mentions the following titles: *Reʾšit ḥokmah*, *Mišpeṭei ha-mazzalot* or *Sefer Mazzalot*; *Ha-ṭeʿamim* (two recensions); *Moladot*; *Sefer ha-Mivḥarim; Sefer ha-Šeʾelot*; *Sefer ha-Meʾorot*; *Sefer ha-ʿOlam u-maḥberot ha-mešaretim kullam*, which he traced in more than fifty manuscripts.

[58] Raphael Levy, *The Astrological Works of Abraham Ibn Ezra: A Literary and Linguistic Study with Special Reference to the Old French Translation of Hagin* (Baltimore: The Johns Hopkins Press, 1927); and Levy and Cantera, *The Beginning of Wisdom.*

[59] N. Ben-Menaḥem, ed., *Rabbenu Avraham Ibn ʿEzraʾ: Sefer ha-Ṭeʿamim* (Jerusalem: Mosad ha-Rav Kook, 1941).

[60] J. L. Fleischer, ed., *Sefer ha-Ṭeʿamim* (Jerusalem: Maḥbarot le-Sifrut, 1951); idem, *Sefer ha-Mivḥarim* (Klaus, 1939); idem, *Sefer ha-ʿOlam*, *ʾOṣar Ḥayyim* 13 (1937): 33–49.

[61] See: Sela, *Abraham Ibn Ezra*, pp. 57–78; Shlomo Sela and Gad Freudenthal, "Abraham Ibn Ezra's Scholarly Writings: A Chronological Listing," *Aleph* 6 (2006): 13–55.

[62] R. Smithuis, "Science in Normandy and England under the Angevins: The Creation of Avraham Ibn Ezra's Latin Works on Astronomy and Astrology," in G. Busi, ed., *Hebrew to Latin–Latin to Hebrew: The Mirroring of Two Cultures in the Age of Humanism* (Turin: N. Arogno, 2006), pp. 23–59; idem, "Abraham Ibn Ezra's Astrological Works in Hebrew and Latin: New Discoveries and Exhaustive Listing," *Aleph* 6 (2006): 239–338.

[63] Cf. also Smithuis, "Science in Normandy and England," p. 26.

[64] Cf. Sela, *Abraham Ibn Ezra*, pp. 58–9, 67–8; Smithuis, "Science in Normandy and England," pp. 27–8.

[65] Recently defended by Sela and Freudenthal, "Ibn Ezra's Scholarly Writings," pp. 20 and 34–6.

reference to such a work is found in the second version of *Ṭeʿamim*, whose date of composition is unknown. Sela argued that the reference must be to a second version of *Meʾorot*, because what he believed to be the first version of the *Sefer ha-Šeʾelot* contains a reference to *Meʾorot* as an already existing work.[66] This argument is plausible, but it is based on two assumptions that – despite Sela's careful argument – have yet to be firmly established: First, that the relevant version of *Šeʾelot* is indeed the first one; second, that a first version of *Šeʾelot* was part of the corpus written in Béziers in 1148. Only if these two assumptions can be demonstrated to be true would Sela's argument that *Sefer ha-Meʾorot* was part of the first corpus and was later rewritten by Ibn Ezra be conclusive. Moreover, it is noteworthy that in their most recent publication, Sela and Gad Freudenthal have given up the hypothesis of two versions of *Sefer ha-Meʾorot*.[67]

Sefer Mišpeṭei ha-mazzalot (Book of the Judgments of the Signs of the Zodiac) poses similarly intricate problems. Whereas Steinschneider regarded this tract as a parallel work to *Ṭeʿamim*,[68] Fleischer thought it was a parallel version of *Reʾšit ḥoḵmah*.[69] Both assumptions were convincingly refuted by Sela, who demonstrated the independence of this work. His attempt to date the text to a comparatively late period, between 1153/4 and 1156/7, however, is problematic.[70] The problem is not why *Mišpeṭei ha-mazzalot* is not mentioned in Ibn Ezra's later works if it was composed in Italy as early as 1146 – as Sela argues – but rather why he does not mention all his other works in *Mišpeṭei ha-mazzalot* if the late date of composition is indeed correct! In *Mišpeṭei ha-mazzalot*, Ibn Ezra mentions a *Sefer ha-Moladot* as a text yet to be written, and the reference to *Sefer Reʾšit ḥoḵmah* as an already existing work is attested in only two manuscripts.[71] This passage cannot really be used for dating the text because it can be interpreted as a scribal interpolation. This assumption is all the more plausible because *Mišpeṭei ha-mazzalot* is attested almost exclusively in manuscripts that also contain *Reʾšit ḥoḵmah*.[72] A mutual contamination of these works is therefore easily conceivable.

Thus the case of *Mišpeṭei ha-mazzalot* exemplifies why a careful textual study of Abraham Ibn Ezra's astrological works must take full account of the history of the manuscript transmission of his works.

Unfortunately, very little is known about the transmission of these books in the period between their composition (middle of the twelfth century) and their earliest attestations in Hebrew manuscripts in the fourteenth century. Indirect literary evidence is scanty and not always very helpful: Even where texts unquestionably evince familiarity with Ibn Ezra's works – for example, the questions sent to Maimonides from southern France[73] or *Sefer ha-Ḥayyim*[74] – the parallels are generally too unspecific to tell us much about the exact forms of their transmission.

The most important evidence for the diffusion of Abraham Ibn Ezra's astrological writings in the late thirteenth century comes from the non-Jewish world – the early French and Latin

[66] Sela, *Abraham Ibn Ezra*, p. 66.

[67] Sela and Freudenthal, "Ibn Ezra's Scholarly Writings," p. 35.

[68] Steinschneider, *Die Handschriften-Verzeichnisse Berlin*, Vol. 2, p. 138 ("Nebenrecension").

[69] Fleischer, *Sefer ha-Ṭeʿamim*, pp. 19–21.

[70] Sela, *Abraham Ibn Ezra*, p. 69–74; Sela and Freudenthal, "Ibn Ezra's Scholarly Writings," p. 39.

[71] Sela, *Abraham Ibn Ezra*, p. 73.

[72] In addition to fourteen manuscripts mentioned by Sela (*Abraham Ibn Ezra*, p. 71 n. 234), *Sefer Mišpeṭei ha-mazzalot* can also be found in Jerusalem, Kappaḥ 36, ff. 138v–150r (Yemen, 19 c.) [IMHM F 47427]. The text is found independently of *Sefer Reʾšit ḥoḵmah* only in this last manuscript, in Vatican, Bibliotheca Apostolica, ebr. 477, ff. 67v–85v (Italy, 16 c.) [IMHM F 530], and in Paris, BNF, héb. 1058, ff. 14v–26r (Spain, 15 c.) [IMHM F 14642].

[73] Cf. Shlomo Sela, "Queries on Astrology Sent from Southern France to Maimonides: Critical Edition of the Hebrew Text, Translation, and Commentary," *Aleph* 4 (2004): 89–190.

[74] Cf. *Sefer ha-Ḥayyim*, ed. Necker, Sections 6, 39, and 91.

translations of his works.[75] The first Old French translation was produced by Hagin le Juif for Henri Bate in northern France (Malines) around 1273. It is attested in two manuscripts, one of which was partly edited by R. Levy and F. Cantera.[76] The manuscripts contain Old French versions of the following works: *Sefer Reʾšit ḥoḵmah* (*Livre du commencement de sapience*), *Sefer ha-Moladot* (*Livre des jugements des nativités*), *Sefer ha-Mivḥarim* (second version; *Livre des elections Abraham*), and *Sefer ha-Šeʾelot* (second version; *Livre des interrogations*).[77]

Henri Bate, the patron of Hagin le Juif's translations, produced Latin translations of *Sefer Reʾšit ḥoḵmah* (*Introductorius ad astronomiam*), the first version of *Sefer ha-ʿOlam* (*Liber coniuncionum qui dicitur de mundo et seculo*), *Sefer ha-Meʾorot* (*De luminaribus seu de diebus creticis*), *Mišpeṭei ha-mazzalot* (*Liber introductorius ad iudicia astrologie*), and the two versions of *Ṭeʿamim* between 1281 and 1292. A second Latin translation of most of these texts was made by Peter of Abano while he was in northern France in 1293. Peter, however, probably did not translate the first version of *Ṭeʿamim* (*Liber rationum*), *Sefer ha-ʿOlam*, and *Mišpeṭei ha-mazzalot*. He did translate the second versions of *Sefer ha-Šeʾelot* (*De interrogationibus*) and *Sefer ha-Mivḥarim* (*De electionibus*). It is very likely that Peter made these Latin versions from the translations by Hagin le Juif (although we do not possess *Sefer ha-Mivḥarim* in Old French, and its existence remains conjectural).[78]

Only from the very late thirteenth century onward we have more extensive evidence of Jews who used Ibn Ezra's astrological works in the original Hebrew. An important example is Levi ben Abraham ben Ḥayyim's *Liwyat ḥen*, which is discussed later in this chapter. He adapted Ibn Ezra's works freely in Book III, chapter 40, of this encyclopedia, adding other sources that have yet to be identified systematically. This procedure often makes it difficult to compare his text to Abraham Ibn Ezra's works directly; some quotations, however, seem to indicate that in addition to *Reʾšit ḥoḵmah* and *Moladot*, he used the second version of *Ṭeʿamim* and the first version of *Šeʾelot*.[79]

Because of the scarcity of evidence, it remains difficult to reach clear-cut conclusions regarding the diffusion of Abraham Ibn Ezra's Hebrew astrological works in the thirteenth century, both in general and in its different versions. All we can be certain about is that different collections of the works circulated in northern France (Henri Bate, *Sefer ha-Ḥayyim*), and that another collection was available to a Jewish author such as Levi ben Abraham in southern France at the end of the century. As to the diffusion of the different versions, it is noteworthy that the "second versions" are slightly preponderant in the French and Latin translations from northern France, although other versions were also known. This "mixture" of versions and the translation of the two versions of *Ṭeʿamim* by Henri Bate indicate that probably by this early date, scholars had access to parallel versions and collected them.

It was not earlier than the fourteenth century that Ibn Ezra's exegetical works regained popularity among Jewish scholars, in what Alexander Altmann called the "Ibn Ezra renaissance."[80] It is surely no coincidence that literary references to Ibn Ezra's astrological

[75] Cf. now also the exhaustive listing in Smithuis, "Abraham Ibn Ezra's Astrological Works," pp. 244–54.

[76] Levy and Cantera, *The Beginning of Wisdom*.

[77] Here I follow the traditional definition of the first and second version of these treatises as expounded by Sela, *Abraham Ibn Ezra*, pp. 64–6.

[78] The later translations of Arnoul de Quincompoix and Ludovicus de Angulo need not to be considered here; cf. Smithuis, "Abraham Ibn Ezra's Astrological Works," pp. 250–1.

[79] Cf. Vatican, Bibliotheca Apostolica, ebr. 383, f. 270v (*Ṭeʿamim*) and f. 275r (*Sefer ha-Šeʾelot*) [IMHM F 464].

[80] Alexander Altmann, "Moses Narboni's 'Epistle on Shi'ur Qomah,'" *Jewish Medieval and Renaissance Studies* (Cambridge, MA: Harvard University Press, 1967), pp. 225–88, on p. 241. It is quite possible that Abraham Ibn Ezra's exegetical work had more extensive influence prior to the fourteenth century than might be indicated by the number of surviving supercommentaries. This was argued by Uriel Simon, "Interpreting the Interpreter: Supercommentaries on Ibn Ezra's Commentaries," Twersky and Harris, *Rabbi Abraham Ibn Ezra*, pp. 86–128, on

teachings begin to multiply in tandem with the sudden explosion in the number of manuscripts containing his astrological works. Steinschneider is probably right that we owe the preservation of so many Ibn Ezra manuscripts to this "school of exegetes":[81] Neoplatonists like Mordecai Comtino, Samuel Ṣarṣa, and Samuel Moṭoṭ used Abraham Ibn Ezra's astrological works.[82] Joseph Bonfils was even aware of the existence of two different versions of *Sefer ha-ʿOlam* and explicitly quotes from both of them,[83] demonstrating that fourteenth-century Jewish scholars were familiar with more extensive collections of astrological works and were conscious of the complexities of Abraham Ibn Ezra's literary corpus.[84]

In view of this literary evidence, it does not come as a total surprise that even among the earliest manuscripts of Ibn Ezra's astrological writings (fourteenth century),[85] we find "accumulative" collections, which contain multiple recensions of Ibn Ezra's astrological works in a single manuscript.[86] Nevertheless, we also possess many manuscripts that transmit exclusively what are generally called the "first versions" of Abraham Ibn Ezra's astrological works,[87] whereas manuscripts containing "second versions" only are rare.[88] There are also,

p. 110. It has to be noted, however, that Simon's interpretation relies primarily on a detailed analysis of Judah Ibn Mosconi's introduction to his supercommentary *ʾEven ha-ʿezer*, which is fraught with numerous uncertainties.

81 Steinschneider, *Die Handschriften-Verzeichnisse Berlin*, Vol. 2, p. 140: "Die astrologischen Lehren des ibn Esra, welche dieser geniale Autor als 'Geheimnis' (ob allen Ernstes, oder für gewisse Mäcene?) nicht selten in seinen *Bibelauslegungen* andeutete, erzeugten, namentlich im XIV. Jahrh., beinahe eine exegetische Schule (vgl. Zunz, Ges. Schr. III, 94), welcher wir vielleicht die Erhaltung so vieler mss. verdanken."

82 For a list of quotations by these authors from the two versions of *Ṭeʿamim*, see Ben-Menaḥem, *Sefer ha-Ṭeʿamim*, pp. VI n. 6 and VII n. 1.

83 Joseph Bonfils Ṭov ʿElem, *Ṣofenat paʿneaḥ*, ed. D. Herzog (Heidelberg: Winters'sche Verlagsbuchhandlung, 1911–30), Version 1, pp. 75, 201, 309; Version 2, pp. 27 and esp. 36: בספר העולם בנוסח השנית ("in the *Book of the World* in the second version"). In addition, his commentary contains many quotations from *Sefer Reʾšit ḥoḵmah*, the first version of *Ṭeʿamim*, *Sefer ha-Moladot*, and *Sefer ha-Meʾorot*.

84 On Joseph Bonfils Ṭov ʿElem as a student of Abraham Ibn Ezra's, see also Rodríguez-Arribas, "Historical Horoscopes of Israel," pp. 153–63.

85 The earliest example of this "accumulative" type of collection seems to be the first part of MS Vatican, Urb. ebr. 47, ff. 1r–53r (Spain, 14 c.) [IMHM F 686]. It contains, in addition to *Sefer Reʾšit ḥoḵmah* and horoscopes, two parallel versions of *Ṭeʿamim* and *Sefer ha-Mivḥarim*. In the second part of the manuscript (ff. 53v–84v), the remaining books were added by a second hand. Other fifteenth- and sixteenth-century manuscripts of this type are Madrid, Biblioteca de la Real Academia de la Historia, Heb. 7 (Ashkenaz/Italy, 15 c.) [IMHM F 7370]; Munich, Bayerische Staatsbibliothek, cod. Heb. 202 (Italy, 15 c.) [IMHM F 1649]; Vatican, Bibliotheca Apostolica, ebr. 477 (Italy, 16 c.) [IMHM F 530]; Cambridge, UL, Add. 1501 (SCR 576; Sephardi, 16 c.) [IMHM F 17118]; Cambridge, UL, Add. 1186 (SCR 575; Italy, 16 c.) [IMHM F 17052]; Berlin, Staatsbibliothek, Or. qu. 679 (Steinschneider 220; Sephardi, 16 c.) [IMHM F 1779].

86 Smithuis ("Abraham Ibn Ezra's Astrological Works," pp. 299–333) provides a comprehensive list of manuscripts that contain astrological works of Abraham Ibn Ezra. This list indicates neither the versions attested in the manuscripts nor whether the manuscripts are codicologically unified. Such data are, however, indispensable for a historical evaluation of the extant manuscripts of Ibn Ezra's astrological works. I have studied microfilms of all the manuscripts cited in the subsequent notes. It goes without saying that these are merely examples and that my listing is not exhaustive. The indication of specific folios within a manuscript means that the manuscript comprises codicologically separate units, even if other parts of it contain other works by Abraham Ibn Ezra.

87 Oxford, Bodleian Library, Opp. Add. Qu. 160 (Neubauer 2518), ff. 13r–164v (Byzantium, 14 c.) [IMHM F 22230]; Paris, BNF, héb. 1055 (Sephardi/Italy, 14 c.) [IMHM F 14658]; Munich, Bayerische Staatsbibliothek, cod. Heb. 304, ff. 1r–145r (Sephardi, 14–15 c.) [IMHM F 1109]; Paris, BNF, héb. 189 (Byzantium, 14/15 c.) [IMHM F 4173]; Dresden, Sächsische Landesbibliothek, Eb. 384 (Sephardi, 15 c.) [IMHM F 20765]; Paris, BNF, héb. 1045, ff. 89r–184v (Sephardi, 15 c.) [IMHM F 33996]; Warsaw, Żydowski Instytut Historyczny 255, ff. 1r–68r (Italy, 1460) [IMHM F 10122]; New York, JTS, Mic. 2623 (Saloniki, 1512) [IMHM F 28876]; Paris, BNF, héb. 1056 (Italy, 15/16 c.) [IMHM F 14659].

88 Cambridge, UL, Add. 481 (SCR 581), ff. 55v–175r (Byzantium, 15 c.) [IMHM F 16778]; Florence, Biblioteca Nazionale Centrale, Magl. III 139 (fourth pagination; Italy, 15 c.) [IMHM F 11978]; Paris, BNF, héb. 1058 (Sephardi, 15 c.) [IMHM F 14642].

however, many early "selective" collections, which combine different versions of Ibn Ezra's works in a quite unsystematic manner, normally without reference to the existence of parallel texts.[89]

It is still too early to reach clear-cut conclusions about the scribal and editorial processes that led to the creation of these different kinds of collections. All we can say for now, as a reasonable working hypothesis, is that a collection of first versions (those written in Béziers in 1148?) circulated widely and was then supplemented by a collection (or collections) of second versions,[90] from which later copyists produced selective collections. This hypothesis, however, requires further investigation and in many cases may well prove to be much too simplistic.

Other Astrological Texts Attributed to Abraham Ibn Ezra

The vast majority of the texts found in manuscripts of Ibn Ezra's astrological corpora are copies of the so-called first and second versions of the works previously described.[91] In view of the predominance of these "canonical" collections in all surviving manuscripts, it seems unlikely that a large number of unknown works or early pseudepigraphic astrological works ascribed to Abraham Ibn Ezra may still show up.

It should be mentioned here, however, that there are a few additional short astrological texts closely associated with Ibn Ezra's works. One of them, published in 1881, is a prognostication based on the conjunction of Saturn and Jupiter in 1166, which was presumably written in 1153/4.[92] It has been identified in six manuscripts. In four of them, the text follows Ibn Ezra's *Sefer ha-Me'orot*,[93] but in two other manuscripts, it is located elsewhere in his "encyclopedia."[94] Modern scholarship[95] has cast doubts on its authenticity, as well as on that of a short horoscope cast for a child born in Narbonne 1160,[96] which has come down to

89 Cambridge, UL, Add. 1517 (SCR 574; Sephardi, 15 c.) [IMHM F 17454]; Paris, BNF, héb. 259, ff. 54r–156v (Sephardi, 15 c.) [IMHM F 27838]. Two important, closely related Spanish manuscripts of this type are Sassoon 823 (now Philadelphia, Schoenberg Collection 57; Spain, 14 c.) [IMHM F 9357] and the fragments to be combined from Vienna, ÖNB, cod. Heb. 132 (Schwartz 185; Spain, 15 c.) [IMHM F 1406], and Moscow, Russian State Library, Guenzburg 840 (Spain, 15 c.) [IMHM F 48061].

90 A manuscript that might reflect such a process is Munich, Bayerische Staatsbibliothek, cod. Heb. 202 (Italy, 15 c.) [IMHM F 1649].

91 I follow the exposition of this conventional definition found in Sela, *Abraham Ibn Ezra*, pp. 57–81.

92 A. Neubauer, "Mittheilungen zur Ibn Ezra-Literatur," *Israelitische Letterbode* 7 (1881–2): 96–9; David Kahana, ed., *Rabbi Avraham Ibn Ezra: Qoveṣ Ḥoḵmat ha-rav A. Ben Ezra* (Warsaw, 1894), Vol. 2, pp. 115–18 and 139. For an English translation and detailed commentary, see Bernard R. Goldstein, "A Prognostication Based on the Conjunction of Saturn and Jupiter in 1166 [561 AH]," in C. Burnett et al., eds., *Studies in the History of the Exact Sciences in Honour of David Pingree* (Leiden: Brill, 2004), pp. 735–53.

93 Cambridge, UL, Add. 1517 (SCR 574), f. 47r–v (Orient, 14/15 c.) [IMHM F 17454]; Dresden, Sächsische Landesbibliothek, Eb. 384, f. 64r–v (Spain, 15 c.) [IMHM F 20765]; Oxford, Bodleian Library, Opp. Add. Qu. 160 (Neubauer 2518), ff. 126v–128r (Byzantium, 1361) [IMHM F 22230]; Paris, BNF, héb. 1057, ff. 94r–95r (Italy, 16/17 c.) [IMHM F 14641].

94 Jerusalem, Kappaḥ 36, ff. 164r–165v (Yemen, 19 c.) [IMHM F 47427] (after first version of *Sefer ha-'Olam*); New York, JTS, Mic. 9536, ff. 71r–72r (Orient, 1770) [IMHM F 49957] (after first version of *Sefer ha-Še'elot*).

95 Cf. J. L. Fleischer, "'Al šenei horosqopim ha-meyuḥasim le-rabbi Avraham Ibn 'Ezra'," in S. Assaf, J. Even-Shemuel, and R. Binyamin, eds., *Minḥah Li-Yehudah* (Jerusalem: Mosad ha-Rav Kook, 1950), pp. 129–240 (in Hebrew); Goldstein, "A Prognostication."

96 Partly edited by M. Steinschneider in *Šenei ha-me'orot: Ma'amar ha-yiḥud le-ha-Rambam* (Berlin, 1847), pp. 3–4; first complete edition in Judah ben Solomon ha-Kohen, *'Otot ha-šamayim hu' Sefer Mišpeṭei ha-koḵavim* (Warsaw, 1886), pp. 23–4; reedited in Kahana, *Qoveṣ Ḥoḵmat ha-rav A. Ben Ezra*, Vol. 2, pp. 119–22 and 139–40.

us in thirteen manuscripts. In most of them, the horoscope follows copies of the first versions of *Sefer ha-Ṭeʿamim* or *Sefer ha-ʿOlam*.[97]

Some of the manuscripts that preserve these two works also contain a text with a horoscope for a child born in AM 4904 (1143/4 C.E.). It obviously was not written by Abraham Ibn Ezra himself, but it is built largely on his doctrines.[98]

The origins of these texts require further investigation. It is quite striking, however, that they all appear either in close connection with so-called first versions of Ibn Ezra's authentic works or in manuscripts in which these versions predominate. We may therefore tentatively conclude that the addition of these texts of applied astrology reflects a textual development within a specific branch of the manuscript transmission of his astrological works.

There are three other texts that may yet be plausibly identified as lost works by Ibn Ezra largely unknown to the early collectors. The first two are a *Sefer ha-Šeʾelot* (chapter 5, most of chapters 6 and 7) and a *Sefer ha-Mivḥarim* (chapters 6–9, with a list of the lunar mansions), contained in a parchment bifolium from a larger codex discovered in the so-called Italian Geniza in the archive in Modena.[99] The manuscript is written in a clear Ashkenazi hand of the fourteenth or early fifteenth century. Repeated references to other astrological works by Ibn Ezra and the explicit statement "and I, Abraham, tried it [many] times" support the assumption that they are indeed works of his. Neither of them is identical with the known recensions of *Šeʾelot* and *Mivḥarim*, although they do seem to be much closer to the corresponding versions conventionally defined as "first" rather than to the "second."[100]

A third text attributed to Abraham Ibn Ezra is found in three fifteenth-century and a few later manuscripts. It, too, bears the title *Sefer ha-Šeʾelot*.[101] This work is neither one of the known books on this subject nor a third (or fourth) version of a work on interrogations; it is, rather, an introduction to astrology in five parts, only four of which have been preserved in the manuscripts. The first part, on the "Use of the Signs of the Zodiac" (*šimmuš ha-mazzalot*),

97 After *Sefer ha-Ṭeʿamim*: Dresden, Sächsische Landesbibliothek, Eb. 384, ff. 41r–42r (Spain, 15 c.) [IMHM F 20765]; Munich, Bayerische Staatsbibliothek, cod. Heb. 202, f. 68r (Italy, 15 c.) [IMHM F 1649]; Nuremberg, Stadtbibliothek, Cent. B. App. 4, pp. 181–7 (Ashkenaz [Christian], 17/18 c.) [IMHM F 8783]; Oxford, Bodleian Library, Mich. 45 (Neubauer 2024), ff. 29v–32r (Ashkenaz, 18/19 c.) [IMHM F 13909]; Vatican, Urb. ebr. 47, ff. 34v–35v (Spain, 14/15 c.) [IMHM F 686]; Warsaw, Żydowski Instytut Historyczny, 255, ff. 35v–37r (Italy, 1460) [IMHM F 10122]; after *Sefer ha-ʿOlam*: Cambridge, UL, Add. 1517 (SCR 574), f. 53r (Orient, 14/15 c.) [IMHM F 17454]; Munich, Bayerische Staatsbibliothek, cod. Heb. 304, ff. 10r–11v (Sephardi, 14/15 c.) [IMHM F 1109]; Paris, BNF, héb. 1057, f. 103v (Italy, 16/17 c.) [IMHM F 14641]. Other contexts: Berlin, Staatsbibliothek, Or. qu. 679 (Steinschneider 220), f. 72r (Orient, 16/17 c.) [IMHM F 1779]; Oxford, Bodleian Library, Opp. Add. Qu. 160 (Neubauer 2518), ff. 162v–164v (Byzantium, 1361) [IMHM F 22230]; St. Petersburg, Institute of Oriental Studies, B 477, ff. 50v–52v [IMHM F 53618]; St. Petersburg, Institute of Oriental Studies, C 76, ff. 135r–135v (Sephardi, 15/16 c.) [IMHM F 69233].

98 Cambridge, UL, Add. 481 (SCR 581), ff. 158v–168r (Byzantium, 15 c.) [IMHM F 16778]; Cambridge, UL, Add. 1517 (SCR 574), ff. 30v–34r (Orient, 14/15 c.) [IMHM F 17454]; Jerusalem, Kappaḥ 36, ff. 166r–173v (Yemen, 19 c.) [IMHM F 47427]; St. Petersburg, Institute of Oriental Studies, C 76, ff. 136r–141v (Sephardi, 15/16 c.) [IMHM F 69233].

99 Modena, Archivio di Stato, 368.3 (Italy, 14/15 c.) [IMHM PH 6548].

100 See M. Bakkal, ed., *Sefer ha-Šeʾelot (nosaḥ šeni)* (Jerusalem: Bakkal, 1995), which is, in fact, the first version; idem, *Sefer ha-Mazzalot we-ha-Šeʾelot le-R. A. Ben ʿEzraʾ* (Jerusalem: Bakkal, 1981). *Sefer ha-Mivḥarim* was published by Fleischer (n. 60 above). For more on the Modena texts, see Shlomo Sela and Renate Smithuis, "Two Hebrew Fragments from Unknown Redactions of Abraham Ibn Ezra's *Sefer ha-Mivḥarim* and *Sefer ha-Šeʾelot*," *Aleph* 9 (2009): 225–40.

101 The early manuscripts from Italy are Munich, Bayerische Staatsbibliothek, cod. Heb. 45, ff. 478r–500v (Italy, 16 c.) [IMHM F 1139], and Oxford, Bodleian Library, Opp. 707 (Neubauer 2025), ff. 114r–141v (Sephardi, 1410) [IMHM F 19319], where it is combined with the *Sefer ha-Šeʾelot* attributed to Ptolemy. Another early manuscript is Vatican, Bibliotheca Apostolica, ebr. 390, ff. 58r–63r (fragmentary; Spain, 14 c.) [IMHM F 472].

is mainly an abbreviated version of the first chapter of *Reʾšit ḥoḵmah*;[102] the second part, on "The Planets" (*ha-mešaretim*), draws on chapter 4 of the same work. Part 3 gives further explanations of general astrological terminology; Part 4, finally, deals with interrogations (*šeʾelot*). The last section of this part is taken from the first version of Ibn Ezra's *Sefer ha-Šeʾelot*. In some manuscripts the fourth part is preceded by a Pseudo-Ptolemaic *Sefer ha-Šeʾelot*, but this should probably be seen as a secondary development.[103] Consequently, in its original form, this *Book of Questions* was a short, independent work, based on Ibn Ezra's authentic works and attributed to him in all existing manuscripts.

Its authenticity can, of course, be doubted. It can be argued that it and the horoscopes previously mentioned are adaptations of authentic works and were produced by later authors. However, as long as we know so little about Abraham Ibn Ezra's working methods and the total number of his works, there is no compelling reason to rule out the possibility that at least some of them contain authentic material. Moreover, it should be noted that the version of the *Sefer ha-Šeʾelot* discussed herein must have been produced no later than the fourteenth century, because it was quoted, under the title *Sefer Šimmuš ha-mazzalot we-šimmuš ha-mešaretim (be-ha-moladot u-mišpeṭei ha-koḵavim)*, by Samuel Moṭoṭ in both recensions of his supercommentary on Abraham Ibn Ezra, *Megillat setarim*.[104] Therefore, even if it is a pseudepigraphical text, this book has considerable weight for the reconstruction of the early history of Abraham Ibn Ezra's corpus.

It is still too early to formulate any conclusions regarding the genesis of the different forms of Ibn Ezra astrological collections found in extant manuscripts. The reconstruction of supposed archetype(s) and the later processes of redaction, selection, and reorganization require much manuscript work and stemmatological analyses. The limited number of well-defined texts that were copied in various different collections without much mutual contamination makes it very likely that Abraham Ibn Ezra's works were transmitted on the basis of a few collections that were produced by a small number of collectors and redactors. What escaped their eyes had little chance to survive. One hopes that future research will enable us to determine with more accuracy where and when the major steps in the crystallization of these different textual corpora were done. At present it has to be kept in mind that our image of Abraham Ibn Ezra's works depends to a great extent on what redactors and scribes did with his texts in the first two centuries after their composition, and that we remain uncertain as to the total number of works and recensions composed by Abraham Ibn Ezra and their textual forms before the creation of the "canonical" corpora.

Ibn Ezra's Astrological Encyclopedia(s) as the Nucleus of Larger Compilations of Hebrew Astrological Texts (Thirteenth and Fourteenth Centuries)

A close study of the composition of late manuscripts that contain collections of astrological texts warrants the conclusion that it was the encyclopedic character of Abraham Ibn Ezra's astrological corpus that prompted the aggregation of further texts to it as a nucleus. The

[102] Shlomo Sela, in "A Fragment from an Unknown Redaction of *Reʾšit Ḥoḵmah* by Abraham Ibn Ezra," *Aleph* 10 (2010): pp. 43–66, argues for a close relationship of this text with the lost second version of the *Sefer Reʾšit ḥoḵmah*, which hypothetically underlies the second version of the *Ṭeʿamim*. See also idem, *Abraham Ibn Ezra, The Book of Reasons: A Parallel Hebrew-English Critical Edition of the Two Versions of the Text* (Leiden: Brill, 2007), pp. 6–8.

[103] This text is missing in MS Vatican, Bibliotheca Apostolica, ebr. 390, ff. 58r–63r (fragmentary; Spain, 14 c.) [IMHM F 472].

[104] For the first recension, cf. Samuel Moṭoṭ, *Megillat setarim* (Venice, 1554), ff. 26r, 27r, and 43r. The same source is quoted by Samuel Moṭoṭ in the second recension; see, e.g., MS Cambridge, UL, Add. 1015.2, ff. 40v–41r, 43r, and 114r.

earliest and probably most widespread accretion is the Hebrew translations of two works by the astrologer Māshāʾllāh: a *Sefer ha-Šeʾelot* and *Sefer be-Qadrut ha-levanah we-ha-šemeš* (Book on the Eclipse of the Moon and the Sun).[105] Both texts, whose Arabic originals are lost, are attested in about thirty manuscripts, almost all of which – dating from the fourteenth century onward – are closely connected with Abraham Ibn Ezra's astrological corpus.[106] This close association of the manuscript traditions has convinced some scholars that Ibn Ezra was the translator of these two treatises. Considerations related to terminology and style, as well as doctrine, render this hypothesis unwarranted.[107] It is much more likely that these texts were added to the collections of Ibn Ezra's original writings during the thirteenth or fourteenth century.

Another rather closely connected group of manuscripts enlarges the corpus of Ibn Ezra's astrology with a *Sefer ha-Šeʾelot* attributed to Ptolemy, but this text has never been identified among the various Ptolemy pseudepigrapha in Arabic and Latin. It is found mainly in manuscripts based on collections that combine so-called first and second versions of Ibn Ezra's astrological works and also contain the works of Māshāʾllāh. Based on the manuscripts, this *Sefer ha-Šeʾelot* cannot be later than the fifteenth century.[108] Here we may take notice of another Pseudo-Ptolemaic text, a *Sefer ha-Mivḥarim,* which has been transmitted in a small number of manuscripts, including one from fourteenth-century Spain.[109]

In other instances, scribes added Qalonymos ben Qalonymos's translations of al-Kindī's astrological and astrometeorological treatises to the nucleus of Abraham Ibn Ezra's astrological works: *Qiṣṣur ha-maʾamar ba-moladot* (Compendium on Nativities), *ʾIggeret maspeqet ba-leḥuyot u-va-maṭar* (Sufficient Epistle on Moisture and Rain), and *ʾIggeret ba-ʿillot ha-meyuḥasot ʾel ha-ʾišim ha-ʿelyonim* (Epistle on the Causes Ascribed to the Heavenly Bodies).[110] The core

[105] Cf. Fuat Sezgin, *Geschichte des Arabischen Schrifttums* (Leiden: Brill, 1967–), Vol. 7, pp. 102–8 [hereinafter *GAS*]. The latter text was edited about a century ago by Moshe Grossberg, *Sefer Mashallah ba-Qadrut* (London, 1902); cf. also Bernard R. Goldstein, "The Book on Eclipses of Masha'allah," *Physis* 6 (1964): 205–13.

[106] Some early examples are Cambridge, UL, Add. 1517 (SCR 574), ff. 60v–62v (Sephardi, 14/15 c.) [IMHM F 17454]; Oxford, Bodleian Library, Opp. Add. Qu. 160 (Neubauer 2518), ff. 154r–161r (Orient/Byzantium, 14 c.) [IMHM F 22230]; Vatican, Urb. ebr. 47, ff. 81v–84v (Italy, 15 c.) [IMHM F 686]; Florence, Biblioteca Nazionale Centrale, Magl. III 139, ff. 83r–84v (Italy, 15 c.) [IMHM F 11978]; Paris, BNF, héb. 1055, ff. 38v–41r (Spain, 14 c.) [IMHM F 14658]; Munich, Bayerische Staatsbibliothek, cod. Heb. 304, ff. 146v–147v (Italy/Ashkenaz, 15 c.) [IMHM F 1109]. It is noteworthy that the Māshāʾllāh texts can be found in all types of collections.

[107] Cf., e.g., Steinschneider, *Die Handschriften-Verzeichnisse Berlin*, Vol. 2, p. 137 ("der sie wahrscheinlich übersetzt hat"); Sela, *Abraham Ibn Ezra*, pp. 75–6.

[108] The oldest manuscripts attesting this text are Munich, Bayerische Staatsbibliothek, cod. Heb. 202, ff. 130r–137v (Italy, 15 c.); Munich, Bayerische Staatsbibliothek, cod. Heb. 45, ff. 491v–497v (Italy, 16 c.) [IMHM F 1139]; and Oxford, Bodleian Library, Opp. 707 (Neubauer 2025), ff. 130v–138r (Sephardi, 1410) [IMHM F 19319]. Later on, this branch of the Abraham Ibn Ezra corpus seems to have become quite popular in the Orient, especially among the Karaites; cf. MSS St. Petersburg, Institute of Oriental Studies, B 150, ff. 180r–186r (Karaite/Byzantium, 18 c.) [IMHM F 53075]; New York, JTS, Mic. 2631, ff. 25r–29r (Istanbul, 1708) [IMHM F 28884]; St. Petersburg, Russian National Library, Evr. II A 245, ff. 29r–36r (fragmentary, Orient, 18 c.) [IMHM F 64521]; St. Petersburg, Institute of Oriental Studies, B 447, ff. 85r–95r (Karaite, 18/19 c.) [IMHM F 53618]; Jerusalem, Kappaḥ 36, ff. 200r–207r (Yemen, 19 c.) [IMHM F 47427].

[109] The text is attested in three manuscripts: Sassoon 823 (now Philadelphia, Schoenberg Collection 57), ff. 93r–94r (Spain, 14 c.); Moscow, Russian State Library, Guenzburg 421, f. 36r–v (Orient, 18/19 c.) [IMHM F 47781]; and St. Petersburg, Institute of Oriental Studies, B 447, f. 141v (fragmentary, Karaite, 18/19 c.) [IMHM F 53618]. The assumption of Y. Tzvi Langermann et al., "The Hebrew Astronomical Codex MS. Sassoon 823," *Jewish Quarterly Review* 78 (1988): 253–92, on p. 259, that "this is a unicum" is consequently no longer correct.

[110] The last two treatises were published by Gerrit Bos and Charles Burnett, *Scientific Weather Forecasting in the Middle Ages: The Writings of Al-Kindi* (London: Kegan Paul International, 2000).

of these compilations, too, usually combines the first and second versions of Ibn Ezra's works, supplemented by the Māshāʾllāh texts. They are attested as early as the fourteenth century – that is, soon after Qalonymos produced his translations in 1314. It is noteworthy, however, that Qalonymos's translations of al-Kindī are never found in manuscripts that also contain Pseudo-Ptolemy's *Sefer ha-Šeʾelot.* Here the manuscript tradition splits into two distinct branches.

Whereas Pseudo-Ptolemy's *Sefer ha-Šeʾelot* and the texts attributed to Māshāʾllāh are transmitted almost exclusively together with the Ibn Ezra corpus, the connection between the latter and Qalonymos's translations of al-Kindī is much less consistent, because they also appear in independent manuscripts. Therefore, one probably has to allow a period of independent circulation of different corpora before some of them became fused into the typical enlarged "astrological library" attested in several manuscripts of the later fourteenth and fifteenth centuries.[111]

Commentaries on Ibn Ezra's Astrological Encyclopedia(s)

Later scholars commented on Ibn Ezra's astrological works, but very few of these commentaries have been preserved. Consequently, little can be said about how many texts were actually composed in this literary genre. The earliest and probably most important of these commentaries has survived in two manuscripts from Italy and Byzantium (fifteenth century), which attribute it to "Maestro Leon."[112] It is likely that this refers to Levi ben Gerson (1288–1344), whose familiarity with Abraham Ibn Ezra's oeuvre is also otherwise well attested.[113]

In the two surviving manuscripts, this commentary is preserved together with the astrological works of another fourteenth-century Jewish scholar from southern France, Immanuel ben Jacob Bonfils of Tarascon, the author of the famous astronomical treatise *Šeš kenafayim* (Six Wings). His astrological works include a commentary on *Mozenei Ḥanok̲* (The Balances of Enoch), in which he shows his familiarity with Abraham Ibn Ezra by referring to his *Sefer ha-Moladot.* This text enjoyed some popularity, as the numerous preserved manuscripts show.[114] Some manuscripts add the commentary by Bonfils in the margins of Ibn Ezra's encyclopedia.[115]

[111] Typical early examples of these comprehensive collections are Cambridge, UL, Add. 1517 (SCR 574; Sephardi, 14/15 c.) [IMHM F 17454]; Madrid, Biblioteca de la Real Academia de la Historia, Heb. 7 (Ashkenaz/Italy, 15 c.) [IMHM F 7370]; Vatican, Urb. ebr. 47, ff. 81v–84v (Italy, 15 c.) [IMHM F 686].

[112] St. Petersburg, Russian National Library, Evr. I 539–546, ff. 11v–16v (Byzantium, 15 c.) [IMHM F 51284], contains the commentaries on *Sefer Reʾšit ḥok̲mah*, the second version of *Ṭeʿamim*, *Sefer ha-Meʾorot*, and *Sefer ha-ʿOlam.* MS Paris, BNF, héb. 1048, ff. 112v–119r (Italy, 15 c.) [IMHM F 31659], contains the first two items only.

[113] Cf. Goldstein, "Astronomy and Astrology in the Works of Abraham Ibn Ezra," *Arabic Sciences and Philosophy* 6 (1996): 9–21, on pp. 17–19; idem, "Levi ben Gerson's Astrology in Historical Perspective," in G. Dahan and C. Touati, eds., *Gersonide en son temps: Science et philosophie médiévales* (Louvain: Peeters, 1991), pp. 287–300, on pp. 290–3; Bernard R. Goldstein and David Pingree, "Levi ben Gerson's Prognostication for the Conjunction of 1345," *Transactions of the American Philosophical Society* 80 (1990), passim.

[114] Amsterdam, Portugees Israelitisch Seminarium Ets Haim, 47 D 20, f. 120r (Italy, 15 c.) [IMHM F 3576]; St. Petersburg, Russian National Library, Evr. I 545 ff. 17v–20r (Byzantium, 15 c.) [IMHM F 51284]; Paris, BNF, héb. 1054, f. 27r–v (Italy, 15 c.) [IMHM F 33997]; New York, JTS, Mic. 2550, ff. 82v–83r (Sephardi, 15 c.) [IMHM F 28803]; Paris, BNF, héb. 903, f. 36r (Ashkenaz, 15 c.) [IMHM F 26859]; New York, JTS, Mic. 2601, f. 152r (Italy/Sephardi-Provençal, 15 c.) [IMHM F 28854]; Oxford, Bodleian Library, Reggio 44 (Neubauer 2050), ff. 8v–9r (Sephardi, 16 c.) [IMHM F 19335].

[115] Berlin, Staatsbibliothek, Or. qu. 679 (Steinschneider 220), f. 42r–v (Orient, 16/17 c.) [IMHM F 1779]; Jerusalem, Benayahu, O 133, f. 58r (Orient, 1750) [IMHM F 44867].

A few other manuscripts of Abraham Ibn Ezra's work include additional commentaries and short explanatory notes.[116] Although they have not yet been systematically studied, there are no indications of the existence of a veritable commentary tradition.

The Diffusion and Reception of Ibn Ezra's Astrological Works in Later Centuries

A few words must be added about the diffusion of Ibn Ezra's astrological writings in different periods and regions. It is important to realize that the sheer quantity of manuscripts containing them is somewhat misleading: It creates the illusion that the entire Jewish Diaspora must have been familiar with his doctrines and writings from the twelfth century onward. This impression is mistaken and must be qualified.

We have already noted that there is little clear-cut evidence for acquaintance with Ibn Ezra's astrological encyclopedia in medieval Ashkenaz and France. Although this is quite surprising, in view of Ibn Ezra's biography, there are no indications that a large number of Jewish scholars in these regions were acquainted with Ibn Ezra's astrological writings in the twelfth, thirteenth, and even fourteenth centuries.

As for the Orient, Maimonides' *Letter to the Sages of Southern France* is telling testimony for the nondiffusion of Ibn Ezra's writings there, too. In a recent article, Shlomo Sela has shown that the French questioners who addressed their queries about astrology to Maimonides were heavily dependent on Ibn Ezra's astrological works.[117] From Maimonides' reply, however, it seems clear that he had probably never read a single line of them.[118] He refers to his acquaintance with "thousands of books replete with vanity and nonsense,"[119] which he describes as Arabic translations from other languages,[120] but says nothing about astrological literature in Hebrew. Abraham Ibn Ezra's works thus do not seem to have reached Egypt by his time. This is consistent with the total absence of his astrological works from the book lists found in the Cairo Geniza.[121]

Even among Spanish Jews, acquaintance with astrological literature in Hebrew in general and with Abraham Ibn Ezra's writings in particular remained unsystematic until the fourteenth century. Thus, whereas a Neoplatonist like Solomon Alconstantin (fourteenth to fifteenth century) does not mention Abraham Ibn Ezra at all in his apology for astrology in the first part of his *Megalleh ʿamuqqot*,[122] Solomon Franco (mid-fourteenth century) had full access to all parts of the astrological encyclopedia. Much the same holds of Joseph Bonfils Ṭov ʿElem (fourteenth century), a scholar of Spanish origin, who was active in the midcentury in

[116] A few examples are as follows: Vatican, Bibliotheca Apostolica, ebr. 477, ff. 22r–23v (Italy, 16 c.) [IMHM F 530], on *Sefer Re'šit ḥokmah*, chapter 9; St. Petersburg, Institute of Oriental Studies, B 117, ff. 34v–37r (Karaite, 1777) [IMHM F 53056] on *Sefer Re'šit ḥokmah*, chapters 9–10; New York, JTS, Mic. 9536, ff. 86v–91r (Orient, 1770) [IMHM F 49957]; Vatican, Bibliotheca Apostolica, ebr. 386, ff. 54v–55v (Italy, 16 c.) [IMHM F 449].

[117] Sela, "Queries in Astrology."

[118] Herbert A. Davidson, in *Moses Maimonides: The Man and his Works* (Oxford: Oxford University Press, 2005), pp. 494–501, points at several inconsistencies between the *Letter* and other works by Maimonides and raises doubts concerning the traditional attribution of this letter to Maimonides. I believe, however, that his important observations do not disprove Maimonides' authorship.

[119] Maimonides, *'Iggerot*, ed. Y. Shilat, 3rd ed. (Maaleh Adumim: Maaliyot, 1995), Vol. 2, pp. 479 and 481.

[120] Here Maimonides repeats the same idea he had already formulated in the *Guide of the Perplexed*. There, however, he does not mention "thousands" but exactly seven Arabic titles.

[121] See the comprehensive publication of all these lists in Nehemia Allony, *The Jewish Library in the Middle Ages: Book Lists from the Cairo Genizah*, ed. M. Frenkel and H. Ben-Shammai (Jerusalem: Ben-Zvi Institute, 2006).

[122] Edited by Dov Schwartz, "Astrology and Astral Magic in the Writings of Solomon Alconstantin," *Jerusalem Studies in Jewish Folklore* 15 (1993): 62–82.

the eastern Mediterranean: He drew extensively on Abraham Ibn Ezra's astrological works to "explain his words through his words."[123]

The dissemination of Abraham Ibn Ezra's writings was thus a complicated process that still requires systematic investigation. As far as presently available evidence goes, we may say that during the twelfth and most of the thirteenth century, only isolated Jewish scholars had full access to Abraham Ibn Ezra's astrological writings. Later on, two factors fostered the popularity of the astrological encyclopedia(s). The first was the activities of scholars interested in Greco-Arabic science in general and in astrology in particular, who, in the thirteenth and fourteenth centuries, used Abraham Ibn Ezra's works as the nucleus for larger compilations of Hebrew astrological texts (in this group one may include figures like the encyclopedist Levi ben Abraham ben Ḥayyim and scholars like Levi ben Gerson). The second factor is the philosophically inspired "Ibn Ezra renaissance" of the fourteenth century. The exact relationship between these two still requires investigation. What can be said at present is that, in much of the Diaspora, wide acquaintance with Ibn Ezra's astrology began only in the fourteenth century.

The popularity of Ibn Ezra's astrological writings in later centuries is documented by numerous Sephardi, Italian, and Byzantine manuscripts (fifteenth and sixteenth centuries) and later by copies produced in the Orient, Ashkenaz, and the Karaite communities (seventeenth to nineteenth centuries). Most of these manuscripts contain more than one of the books of the "encyclopedia." Only *Reʾšit ḥoḵmah* was often copied separately, finding its way into nearly twenty scientific, astrological, astronomical, and philosophical manuscripts.

It is noteworthy that despite their broad circulation in manuscript form, Ibn Ezra's astrological works were not printed until the twentieth century. A critical edition of *Sefer Reʾšit ḥoḵmah* was published by R. Levy and F. Cantera in 1939. This was followed by smaller editions of varying quality, by J. L. Fleischer, N. Ben-Menaḥem, and M. Bakkal. Recently a new critical edition of the two versions of *Ṭeʿamim* was published by Shlomo Sela.[124] This surprising phenomenon requires further investigation. Nothing is known of an explicit ban on printing Ibn Ezra's astrological works. It is noteworthy, however, that a scholar and bibliophile like Ḥayyim Joseph David Azulai (1724–1807) did not mention the astrological works in the entry on Abraham Ibn Ezra in his *Šem ha-gedolim*,[125] although they were surely accessible to him in the eighteenth century. Instead, he presumably alludes to them in the remark that he "saw in manuscripts seven books which Abraham Ibn Ezra composed on sciences." The study of the reception of Abraham Ibn Ezra's astrological works thus proves to be a no less fascinating field for further research than are his works themselves.

OTHER HEBREW SCIENTIFIC ASTROLOGICAL LITERATURE IN THE MIDDLE AGES

No other Hebrew author of astrological works had an influence on Jewish and non-Jewish culture comparable to that of Abraham Ibn Ezra. This holds even for Abraham Bar Ḥiyya (ca. 1065–1140), whose *Megillat ha-megalleh* (The Scroll of the Revealer) preceded Ibn Ezra's works by a few decades. *Megillat ha-megalleh* deals with eschatology rather than astrology, and only the fifth and last chapter deals with mundane astrology, treated according to the theory of the Great Conjunctions. Like Ibn Ezra, Bar Ḥiyya makes few references to Hebrew sources. It is only from his *Letter to Judah b. Barzillai*, a defense of the halakhic legitimacy of

[123] Joseph Bonfils Ṭov ʿElem, *Ṣofenat paʿneaḥ*, p. 1:8.

[124] Sela, *The Book of Reasons.*

[125] Ḥayyim Joseph David Azulai, *Šem ha-gedolim*, ed. I. Benjacob (Vilna, 1853; repr. Jerusalem, 1994), p. 20.

astrology, that we know that he was familiar with the astrological *baraitot*.[126] Bar Ḥiyya drew his information about the theory of the Great Conjunction from Arabic and possibly also Latin works, which remain to be identified.[127]

Although quotations by later authors leave no doubt that Bar Ḥiyya's work was influential in the Middle Ages, it is difficult to determine its role as a mediator of astrological knowledge in medieval Jewish culture.[128] The book is preserved in four complete copies,[129] but in only one of them are there a few marginal notes, indicating that a reader was more interested in astrology than in the other parts of the book.[130] A Byzantine manuscript of the fourteenth century, however, contains excerpts from the second chapter and the entire fifth chapter, along with other astrological treatises, mainly by Ibn Ezra.[131]

Paradoxically, it seems to have been Bar Ḥiyya and not the itinerant Ibn Ezra who brought medieval Ashkenazi Jewry into first contact with Greco-Arabic scientific astrology. He is quoted as an authority on this issue as early as the second half of the twelfth century in Joseph Bekhor Shor's commentary on Exod. 1:21[132] and Deut. 28:63.[133] It may thus be no accident that one of the earliest manuscripts of *Megillat ha-megalleh* was copied in fourteenth-century Ashkenaz.[134]

In the Orient, acquaintance with Bar Ḥiyya's astrology is not well attested. Some have suggested that Maimonides' allusion, in the *ʾIggeret Teman*, to a "well-versed Andalusian" (*aḥad ḥadāʾiqina bi-bilād al-Andalus*) who published messianic prophecies based on astrological calculations, refers to the author of the *Megillat ha-megalleh*. This, however, is not necessarily the case.[135] In contrast, some medieval Christian authors display familiarity with Bar Ḥiyya's

[126] Abraham Bar Ḥiyya, *Megillat ha-megalleh*, chapter 5; idem, *ʾIggeret Avraham Bar Ḥiyya ha-Nasi*ʾ, p. 29. The *Baraita de-Mazzalot* was also known to Judah b. Barzillai, Abraham's opponent; see Judah Barzillai, *Peruš Sefer Yeṣirah*, ed. S. J. Halberstam (Berlin, 1885), p. 259.

[127] The only astrologer mentioned by name is Ptolemy: *Megillat ha-megalleh*, p. 119. The question of Abraham Bar Ḥiyya's astrological sources deserves further investigation. Natural candidates for his theories on mundane astrology and the Great Conjunction are, of course, the works of Māshāʾllāh and Abū Maʿshar, but some peculiarities in Bar Ḥiyya's descriptions may reflect the use of additional sources; see Guttmann's introduction to his edition of *Megillat ha-megalleh*, pp. XX–XXI, where he criticizes the earlier study by Steinschneider, "Apocalypsen."

[128] Cf. Guttmann's introduction to his edition of *Megillat ha-megalleh*, pp. XXI–XXVII.

[129] Frankfurt a. M., Stadt- und Universitätsbibliothek, Heb. qu. 1 (Striedl/Róth Nr. 284; Ashkenaz, 14 c.) [IMHM F 4207]; Munich, Bayerische Staatsbibliothek, cod. Heb. 10, ff. 174r–267v (Ashkenaz, 16 c.) [IMHM F 23105]; Oxford, Bodleian Library, Or. 160 (Neubauer 1233; Sephardi, 17. c.) [IMHM F 22047]; Amsterdam, Bibliotheca Rosenthaliana, 29 (Fuks 273; Ashkenaz, 19 c.) [IMHM F 3854]. MS Jerusalem, JNUL, Heb. 28°754 (Ashkenaz, 20 c.) [IMHM: B 301], is the copy prepared by A. Poznanski for his edition.

[130] Frankfurt a. M., Stadt- und Universitätsbibliothek, Heb. qu. 1, f. 43v (= *Megillat ha-megalleh*, p. 117). The horoscope on f. 53r–v (= p. 148) was cut out. There are also some calculations on ff. 39v and 40r (= pp. 107–8).

[131] Cambridge, UL, Add. 481 (SCR 581), ff. 175r–209v [IMHM F 16778], entitled *Sefer ʿOlam ha-šeni* (Second Book of the World). On a page added to MS Oxford, Bodleian Library, Opp. 25 (Neubauer 221), f. 6r–v (Italy, 14/15 c.) [IMHM F 16357], a passage from the fifth book of *Megillat ha-megalleh* (ed. Poznanski and Guttmann, pp. 151:15–4:31) is copied under Abraham Ibn Ezra's name as *Sefer ha-Qeṣ*.

[132] Y. Nevo, the editor of Bekhor Shor's commentary (Jerusalem: Mosad ha-Rav Kook, 1994), considers this to be a later gloss, as also did Y. Gellis, *Sefer Tosafot Hashalem: Commentary on the Bible* (Jerusalem: Mifal Tosafot Hashalem, 1982ff.), Vol. 6, p. 30. In view of Bekhor Shor's second quotation from this book, however, this is not necessarily the case.

[133] The passage refers to *Megillat ha-megalleh*, pp. 104 and 151.

[134] Frankfurt a. M., Stadt- und Universitätsbibliothek, Heb. qu. 1. On Abraham Bar Ḥiyya's influence on the teachings of *Ḥasidei Ashkenaz*, see Gershom Scholem, "Reste neuplatonischer Spekulationen in der Mystik der deutschen Chassidim," *Monatsschrift für Geschichte und Wissenschaft des Judentums* 75 (1931): 172–92; J. Dan, *The Esoteric Theology of Ashkenazi Hasidism* (Jerusalem: Mosad Bialik, 1968), pp. 18–30, 40, 157, and 204–5 (in Hebrew).

[135] This idea is strongly refuted with important arguments by Guttmann, *Megillat ha-megalleh*, pp. XXIII–XXIV.

astrological teachings: French and Latin translations of the fifth chapter of *Megillat ha-megalleh* were produced, possibly in the same circles around Henri Bate, which were also responsible for the translation of Abraham Ibn Ezra's writing in the second half of the thirteenth century.[136]

During the thirteenth century, activity in the field of Hebrew astrological literature increased as a result of the increasing transfer of Greco-Arabic science into Hebrew. An important figure in this field was Judah ben Solomon ha-Kohen, who wrote his encyclopedia *Midraš ḥokmah* in Arabic and then translated it into Hebrew in Italy (Tuscany) around 1247.[137] The second part of this work, which deals with the mathematical sciences, contains a description of astrology largely based upon Ptolemy's *Tetrabiblos*; it is difficult to say much about Judah ben Solomon's other Arabic sources. It is quite telling of the still-limited diffusion of astrological literature in Hebrew in the middle of the thirteenth century that Judah mentions neither any earlier Jewish works like the *baraitot* nor the astrological works of Abraham Ibn Ezra, who left no imprint on *Midraš ḥokmah*.

Midraš ḥokmah became one of the more influential Hebrew scientific books in the later Middle Ages. More than forty manuscripts, dating from the thirteenth to eighteenth centuries and from almost every region of the Diaspora, contain partial or complete copies of it. Of the twelve manuscripts that preserve the astrological section, five also contain other parts of the book;[138] consequently, no conclusions can be drawn about the scribes' or readers' special interest in astrology. In contrast, the five manuscripts that contain only the astrological section clearly reveal the users' interest in that subject. The existence of this independent "astrological excerpt" from the encyclopedia can be traced back to fifteenth-century Spanish manuscripts, but in later periods it is attested in manuscripts from Italy and Ashkenaz as well.[139] The printed edition of the astrological section of *Midraš ḥokmah* – one of the few Hebrew astrological texts to have been printed at all – presumably goes back to such a copy.[140]

A second important figure for Hebrew astrological literature in the thirteenth century is Jacob ben Elijah. He was probably a native of Montpellier, but many details of his biography (including dates of birth and death) are unknown. It is likely that he is to be identified with

[136] See Guttmann, *Megillat ha-megalleh*, pp. XXXV–XLI, with a partial edition of the Latin text.

[137] Cf. Steinschneider, *Die Hebräischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893; repr. Graz, 1956), pp. 1–4 [hereinafter *HÜ*]; Gad Freudenthal, "Les sciences dans les communautés juives médiévales de Provence: Leur appropriation, leur rôle," *Revue des études juives* 152 (1993): 29–136, on pp. 53–5; Resianne Fontaine, "Judah ben Solomon ha-Cohen's *Midrash ha-Ḥokhmah*: Its Sources and Use of Sources," in S. Harvey, ed., *The Medieval Hebrew Encyclopedias of Science and Philosophy* (Dordrecht: Kluwer, 2000), pp. 191–210; Y. Tzvi Langermann, "Some Remarks in Judah ben Solomon ha-Cohen and his Encyclopedia *Midrash ha-Ḥokhmah*," ibid., pp. 371–89.

[138] The oldest of these manuscripts are as follows: Oxford, Bodleian Library, Mich. 551 (Neubauer 1321, Orient/Byzantium, 13/14 c.) [IMHM F 22135]; Paris, BNF, héb. 264 (Orient, 14 c.) [IMHM F 4272]; and Vatican, Bibliotheca Apostolica, ebr. 338 (Spain, 15 c.) [IMHM F 377]. Later copies from Ashkenaz are Moscow, Russian State Library, Guenzburg 1174 (Ashkenaz, 1613) [IMHM F 48190] and Prague, Jewish Museum, 264 (Ashkenaz, 1637) [IMHM F 46518].

[139] Cf. Milan, Biblioteca Ambrosiana, J 17 Inf., ff. 86r–96v (Spain/Italy?, 15 c.) [IMHM F 18295]; Vienna, ÖNB, cod. Heb. 93 (Schwartz 186), ff. 88r–107v (Spain, 15 c.) [IMHM F 1369]; Madrid, Biblioteca de la Real Academia de la Historia, Heb. 7, ff. 182r–198r (Ashkenaz/Italy, 15 c.) [IMHM F 7370]. Later copies are Vienna, ÖNB, cod. Heb. 195 (Schwartz 196), ff. 101r–105r (Italy, 17 c.; fragmentary) [IMHM F 1457]; Mantua, Comunità Israelitica, ebr. 28, ff. 1r–13v (Italy, 17 c.) [IMHM F 808]; Oxford, Bodleian Library, Mich. 71 (Neubauer 2010; Ashkenaz, 17 c.) [IMHM F 19295]. The early manuscript Paris, BNF, héb. 1028, ff. 93r–110v (Spain, 1342) [IMHM F 15720] provides a shorter text and seems to be independent of the other manuscripts.

[140] Judah ben Solomon ha-Kohen, *ʾOtot ha-šamayim huʾ Sefer Mišpeṭei ha-kokavim* (Warsaw, 1886). The editor, E. Shapira, mentions a "very old Italian manuscript" (f. 1v).

the author of a letter to the convert Friar Paul in the second half of the thirteenth century, although modern scholars do not agree on this point.[141] In the field of astrology, Jacob ben Elijah's outstanding achievements are his translations of the *Great Introduction* (*Ha-mavoʾ ha-gadol*) by the Arabic astrologer Abū Maʿshar al-Balḫī (787/886)[142] and of the Pseudo-Ptolemaic *Centiloquium* (*Meʾah šeʿarim*), both made on the basis of Latin texts.[143] In a short introduction at the beginning of *Ha-mavoʾ ha-gadol*, Jacob provides some information about his own biography and alludes to the fact that he produced his translation in Venice.[144] He is full of praise for Abū Maʿshar's book and probably hoped that the Hebrew version would become popular among his fellow Jews. This wish does not seem to have been fully realized; except for one manuscript, which is probably the translator's autograph,[145] we possess relatively few copies of this work. All of them were probably produced in Italy during the fifteenth century (one in the seventeenth century).[146] Thus, the circulation of Jacob's translations seems to have been even more limited than the number of preserved manuscripts suggests.[147]

Toward the end of the thirteenth century, the Provençal scholar Levi ben Abraham ben Ḥayyim of Villefranche wrote his encyclopedia, *Liwyat ḥen*,[148] which was to be become highly controversial in later years. Its third book offers a detailed account of astronomy (chapters 1–39); a long chapter (40), almost one-third of the book, is devoted to astrology. The discussion is based largely on Abraham Ibn Ezra. Significantly, the sections on astronomy and astrology are by far the best-documented part of the work in the manuscript tradition, most of which

[141] For a recent skeptical reappraisal of this issue, see Robert Chazan, "The Letter of R. Jacob ben Elijah to Friar Paul," *Jewish History* 6 (1992): 51–63, with references to earlier studies.

[142] Cf. F. Sezgin, *GAS*, Vol. 7, pp. 139–51.

[143] Cf. Steinschneider, *HÜ*, pp. 530 and 570–1. The translation of the *Great Introduction* is based on the translation by John of Seville (1133), probably in the version revised by Gerard of Cremona (1114–87) in 1171; cf. Abū Maʿshar al-Balḫī, *Liber introductorii maioris ad scientiam judiciorum astrorum*, ed. Richard Lemay (Naples: Istituto Universitario Orientale, 1996), Vol. 4, pp. 218–75. Jacob ben Elijah used the Latin version, which bears the incipit *Iam scripsi*, for his translation of the *Centiloquium*. Francis J. Carmody, in *Arabic Astronomical and Astrological Sciences in Latin Translation: A Critical Bibliography* (Berkeley: University of California Press, 1956), p. 16, attributes it to John of Seville; however, Lemay, *Liber introductorii maioris*, pp. 17–18, argues convincingly for Plato of Tivoli as the translator. Lemay also mentions and describes (pp. 168–80) a thirteenth-century Latin manuscript (Vatican, lat. 6766) that combines both texts in the versions later translated by Jacob. It remains unknown, of course, whether his *Vorlage* had any direct connection with it.

[144] Partly reproduced in B. Dinur, *A Documentary History of the Jewish People from Its Beginnings to the Present* (Tel Aviv: Dvir, 1966), 2nd series, Vol. 2, Book 2, p. 82 (in Hebrew). For a French translation, see Joseph Shatzmiller, "Jacob ben Elie, traducteur multilingue à Venise à la fin du XIII[e] siècle," *Micrologus* 11 (2001): 195–202, on pp. 198–9.

[145] Florence, Biblioteca Medicea Laurenziana, Or. 67 [IMHM F 17986].

[146] *Mavoʾ ha-gadol*: New York, JTS, Mic. 2601, ff. 1r–72v (Italy/Sephardi, 15 c.) [IMHM F 28854]; Paris, BNF, héb. 1034 (Italy/Sephardi, 1439) [IMHM F 15725]; Vienna, ÖNB, cod. Heb. 195 (Schwartz 196), ff. 1r–80v (Italy, 17 c.) [IMHM 1457]; *Meʾah šeʿarim*: Paris, BNF, héb. 1065, ff. 70v–98v (Italy/Sephardi, 1422) [IMHM F 31301]; Parma, Biblioteca Palatina, cod. 2622 (De Rossi 1171, Richler 1464; Sephardi, 15 c.) [IMHM F 13538]; New York, JTS, Mic. 2601, ff. 153r–165v (Italy/Sephardi-Provençal, 15 c.) [IMHM F 28854]; Vienna, ÖNB, cod. Heb. 195 (Schwartz 196), ff. 81r–93v (Italy, 17 c.) [IMHM F 1457].

[147] It is significant that the fifteenth-century Byzantine manuscript Munich, Bayerische Staatsbibliothek, cod. Heb. 36, f. 231r [IMHM F 1166], quotes from chapter IV.1 of the *Great Introduction*, but this quotation does not stem from Jacob ben Elijah's translation.

[148] Cf. Colette Sirat, "Les différentes versions du Livyat Ḥen de Lévi b. Abraham," *Revue des études juives* 122 (1963): 167–77; A. S. Halkin, "Why Was Levi ben Hayyim Hounded?" *Proceedings of the American Academy for Jewish Research* 34 (1966): 65–76; Warren Zev Harvey, "Levi ben Abraham of Villefranche's Controversial Encyclopedia," in S. Harvey, ed., *Medieval Hebrew Encyclopedias*, pp. 171–88 on pp. 186–8; Schwartz, *Astral Magic*, pp. 245–52; Ḥayyim Kreisel, ed., *Levi ben Avraham: Livyat Ḥen: Book Six Part Three, The Work of Creation* (Jerusalem: World Union of Jewish Studies, 2004), pp. 1–33 (in Hebrew).

comes from the fourteenth to sixteenth centuries, from Spain, Italy, and Byzantium. This shows that later readers in these regions welcomed *Liwyat ḥen* primarily as a book for the study of astronomy and astrology.[149]

Levi ben Abraham's work should be distinguished from another encyclopedic work, *Sefer ha-Kolel*, with which it was sometimes confused in modern research. The latter is anonymous and is preserved in five Italian and Sephardi manuscripts of the fifteenth and seventeenth centuries.[150] Its chapters 36–40 constitute a long section on astrology, in which the author "slavishly followed the astrological writings of Abraham Ibn Ezra."[151] The author and date of *Sefer ha-Kolel* are unknown, but it may well be considerably later than *Liwyat ḥen*.

At the beginning of the fourteenth century, Qalonymos ben Qalonymos (1286–after 1328) played an important role in the translation of scientific texts from Arabic into Hebrew.[152] Dissatisfied with his knowledge of Arabic and unable to find suitable teachers in the Midi, he went to Barcelona to gain more proficiency in this language. Between 1309 and 1317, Qalonymos translated numerous books from Arabic into Hebrew. Four of these translations, all produced in 1314, are of astrological works.[153] His translation of the *Centiloquium* became considerably more popular than that by Jacob ben Elijah, produced half a century earlier in Italy, and survives in no fewer than ten manuscripts, the earliest dating from 1342 (Spain).[154] It also served as the basis for a commentary by Eliezer of Recetto[155] and was abbreviated by a late Ashkenazi scribe.[156]

As already noted, Qalonymos ben Qalonymos's translations were transmitted in close connection with the works of Abraham Ibn Ezra. This applies in a few instances to *Sefer ha-Peri* (Book of the Fruit), the translation of the *Centiloquium*,[157] but much more often for the translations of al-Kindī's works.[158] It seems fair to say that the oldest extant manuscripts of

[149] G. Freudenthal, in "Sur la partie astronomique du *Liwyat Ḥen* de Lévi ben Abraham ben Ḥayyim," *Revue des études juives* 148 (1989): 103–12, on pp. 107–8, lists nine manuscripts for the astronomical and astrological sections of the *Liwyat ḥen*, three of which contain the astrological chapter 40 only.

[150] Ibid., p. 108.

[151] Levy, *The Astrological Works*, p. 19.

[152] Cf. Moritz Steinschneider, "Kalonymos ben Kalonymos," *Gesammelte Schriften*, Vol. 1, pp. 196–215; Freudenthal, "Les sciences dans les communautés juives," pp. 70–5.

[153] See supra (p. 269) the subsection: Ibn Ezra's Astrological Encyclopedia(s) as the Nucleus of Larger Compilations of Hebrew Astrological Texts (Thirteenth and Fourteenth Centuries).

[154] Paris, BNF, héb. 1028, ff. 113r–146v [IMHM F 15720].

[155] Naples, Biblioteca Nazionale Vittorio Emanuele, III F 12, ff. 129r–v and 138v–151v (Italy, 15 c.) [IMHM F 11526]; Vatican, Bibliotheca Apostolica, ebr. 477, ff. 142r–176r (Italy, 16 c.) [IMHM F 530].

[156] Cambridge, UL, Add. 398,2 (SCR 693), ff. 136v–140v (Italy/Ashkenaz, 17 c.?) [IMHM F 16313].

[157] Paris, BNF, héb. 1055, ff. 52r–66v (Sephardi, 14 c.) [IMHM F 14658]; Leiden, Bibliotheek der Rijksuniversiteit, cod. or. 4731, pp. 91–126 (Italy, 15/16 c.) [IMHM F 19186]; Berlin, Staatsbibliothek, Or. ff. 1618 (Steinschneider 219), ff. 27r–45r (Italy, 16 c.) [IMHM F 1817]. Together with Nicomachus of Gerasa in the same manuscript in Paris, BNF, héb. 1028 (Spain, 1342) [IMHM F 15720]; Paris, Bibliothèque Mazarine, No. 4778 (Sephardi, 15 c.) [IMHM F 4414]; independently in Oxford, Bodleian Library, Opp. 763 (Neubauer 2009), ff. 3r–103v (Spain, 1373) [IMHM F 19294]; Vatican, Bibliotheca Apostolica, ebr. 382 (Italy/Ashkenaz, 15 c.), ff. 104v–126v [IMHM F 463].

[158] Examples from the fourteenth to sixteenth centuries are Paris, BNF, héb. 1055, ff. 68r–81r (Sephardi, 14 c.) [IMHM F 14658]; Cambridge, UL, Add. 1517 (SCR 574), ff. 53v–60r (Orient/Byzantium, 14 c.) [IMHM F 17454]; Munich, Bayerische Staatsbibliothek, cod. Heb. 304, ff. 128r–136r and 148r–149v (Sephardi, 14/15 c.) [IMHM F 1109]; Vatican, Urb. ebr. 47, ff. 75r–81v (Sephardi/Italy, 14/15 c.) [IMHM F 686]; Madrid, Biblioteca de la Academia de la Historia, Heb. 7, ff. 176r–180v (Ashkenaz/Italy, 15 c.); Paris, BNF, héb. 1056, ff. 100r–101v (Italy, 15 c.) [IMHM F 14659]; Berlin, Staatsbibliothek, Or. ff. 1618 (Steinschneider 219), ff. 20r–26v (Italy, 16 c.) [IMHM F 1817]; and Vatican, Bibliotheca Apostolica, ebr. 477, ff. 41r–52r (Italy, 16/17 c.) [IMHM F 530].

Qalonymos's translations are, in fact, manuscripts of the Ibn Ezra corpus, to which Qalonymos texts were appended. Closer study will be necessary to determine the history of the relationship between the textual corpora of the two authors.

In the second half of the fourteenth century, Solomon ben David (Davin) of Rodez, a student of Immanuel ben Jacob Bonfils', translated the *Kitāb al-bāriʿ fī aḥkām al-nuǧūm* (Brilliant Book on the Judgments of the Stars) by Abū al-Ḥasan Ibn Abī al-Riǧāl (eleventh century) from Latin into Hebrew, as *Sefer Mišpeṭei ha-kokavim.*[159] Although there were several Hebrew translations of this work, that by Solomon ben David is the only one that had any real circulation.[160] It is attested in three manuscripts from Sephardi traditions in southern Europe and North Africa.[161]

Later in the fourteenth century, two other astrological works were translated, each of them twice, from Latin into Hebrew; both enjoyed considerable popularity. These are *De judiciis astronomiae*, by Arnaldus de Villanova (ca. 1235–1311), and Pseudo-Hippocrates' *De esse aegrotorum secundum lunam*. The former is a short compendium that was first translated by Jacob ben Judah Qabreṭ in Barcelona in 1381. His translation did not circulate widely.[162] *De judiciis astronomiae* was translated a second time by Solomon ben Avigdor, in Montpellier in 1393, under the title *Panim ba-mišpaṭ*. This translation, which gained considerably more popularity, was copied several times, along with other tracts on medicine and medical astrology.[163] It is attested in no fewer than fourteen manuscripts from the fifteenth to seventeenth centuries, from Spain and Provence, Italy, Byzantium, and perhaps even Ashkenaz. It seems noteworthy that although Arnaldus de Villanova was a Scholastic physician, who wrote his tract primarily for students of medicine, Solomon ben Avigdor's Hebrew translation never appears in medical manuscripts. The reason for this seems to be that the translator himself had a personal interest in astronomy and astrology – he also translated John of Sacrobosco's *Tractatus de sphaera* (*Marʾeh ha-ʾofannim*) – and consequently "detached" the astrological texts from their original context.[164] *Panim ba-mišpaṭ* was often copied together with Solomon's Hebrew version of Sacrobosco's *Tractatus*, a classic of Latin astronomical literature.[165] This explains the inclusion of both works in astronomical and mathematical collections.[166]

159 Steinschneider, *HÜ*, pp. 578–80; cf. also F. Sezgin, *GAS*, Vol. 7, pp. 186–8.

160 Steinschneider, *HÜ*, p. 580, discusses some of the relevant manuscripts.

161 Vienna, ÖNB, cod. Heb. 52 (Schwartz 198; Sephardi, 15 c.) [IMHM F 1329]; Paris, BNF, héb. 1067 (Italy, 16 c.) [IMHM F 15728]; Oxford, Bodleian Library, Reggio 12 (Neubauer 2030, Maghreb, 17 c.) [IMHM F 19315].

162 Cf. Steinschneider, *HÜ*, p. 783.

163 Together with Ps.-Hippocrates' *De esse aegrotorum secundum lunam* (*Ha-ʾavḥanah ha-refuʾit le-fi meqom ha-levanah*) in Oxford, Bodleian Library, Mich. Add. 19 (Neubauer 2042), ff. 2r–4v and 5r–9r (Provence, 15 c.) [IMHM F 19327]; New York, JTS, Mic. 2601, ff. 81r–82v and 83r–85v (Sephardi, 15 c.) [IMHM F 28854]; Vienna, ÖNB, cod. Heb. 195 (Schwartz 196), ff. 117r–118r and 118r–122v (Italy, 17/18 c.) [IMHM F 1457]. With other medical treatises in New York, JTS, Mic. 2692, ff. 23r–33v (Ashkenaz, 16 c.) [IMHM F 28945]. Cf. also Steinschneider, *HÜ*, p. 782–3.

164 Cf. Steinschneider, *HÜ*, p. 643.

165 London, British Library, Add. 27,106 (Margaliouth 1005), ff. 82r–98v (Italy, 1459) [IMHM F 5781]; Berlin, Staatsbibliothek, Or. qu. 747 (Steinschneider 204), ff. 68r–86r (Sephardi, 15 c.) [IMHM F 1763]; Florence, Biblioteca Medicea Laurenziana, Gaddi 131, ff. 1–12 (Sephardi, 15 c.) [IMHM F 20369]; New York, JTS, Mic. 9121, ff. 1r–7v (Ashkenaz, 1547) [IMHM F 49568]; Berlin, Staatsbibliothek, Or. qu. 645 (Steinschneider 116), ff. 118v–133v (Sephardi, 16 c.) [IMHM F 1770].

166 Other astronomical manuscripts containing Arnaldus's *Panim ba-mišpaṭ* are Florence, Biblioteca Medicea Laurenziana, Plut. 88.30, ff. 116r (Italy, 15 c.) [IMHM F 17853]; New York, JTS, Mic. 2601, ff. 147v–151v (Sephardi, 15 c.) [IMHM F 28854]; Oxford, Bodleian Library, Opp. Add. Qu. 175 (Neubauer 2582), ff. 24r–30v (Ashkenaz, 15 c.) [IMHM F 22285]; Munich, Bayerische Staatsbibliothek, cod. Heb. 249, ff. 182r–206r (Sephardi,

A rare exception in this respect is Tanḥum ben Moses of Beaucaire. He was quite enthusiastic about Solomon ben Avigdor's translation of Arnaldus and decided to append to it a medical text: his own translation of Pseudo-Hippocrates' *De esse aegrotorum*, to which he gave the Hebrew title *Panim le-fanim* (Face to Face). His translation, which can be dated to 1406,[167] must not be confused with an earlier one (1392–1402) by Leon Josef of Carcassonne,[168] which is preserved in the translator's autograph and in two fifteenth-century Italian manuscripts.[169]

After the expulsion from Spain, Isaac ben Samuel Abū-l-Khayr produced two translations, one of the genethlialogical part of Abū Bakr ben al-Ḥasīb's *Madḫal ilā ʿilm al-hayʾa* (Introduction to the Science of Astronomy)[170] and the other of Ibn Riğāl's *Kitāb al-Bāriʿ*, from Latin into Hebrew (1498).[171]

The fourteenth century was also a more prolific period for the composition of original works of astrology in Hebrew. Most of them were written by Jewish scholars from southern France, like the astronomer David ben Yom Ṭov Poʿel (Perpignan), who wrote a short treatise for physicians on basic issues of medical astrology. This text was recently published under the title *Kelal qaṭan* (Minor Rule),[172] in a critical edition based on four Hebrew manuscripts.[173] This work, one of the very few texts of medical astrology in Hebrew, was eventually translated into Latin.[174]

Levi ben Gerson (1288–1344), who draws on astrology in his theological and exegetical works, wrote a commentary on some of Abraham Ibn Ezra's astrological works[175] and composed a prognostication for the Great Conjunction of 1345, preserved in a single Hebrew manuscript.[176] It was later translated also into Latin.[177] Another text written in this period is the short collection of astrological chapters by Immanuel ben Jacob Bonfils of Tarascon

15 c.) [IMHM F 1658]; Paris, BNF, héb. 1061, ff. 197r–209v (Byzantium, 15/16 c.) [IMHM F 14645]; Berlin, Staatsbibliothek, Or. ff. 1618, ff. 46r–52r (Italy, 1577) [IMHM F 1817]; Mantua, Comunità Israelitica, ebr. 28, ff. 48r–58v (Italy, 16 c.) [IMHM F 808]; Oxford, Bodleian Library Reggio 13 (Neubauer 2028), ff. 77r–82v (Sephardi, 16 c.) [IMHM F 19313].

167 Cf. Steinschneider, *HÜ*, pp. 666–7.

168 The translation is extant only in copies that combine this text with Jacob ben Judah Qabreṭ's abbreviated translation of *De Judiciis Astronomiae*, already discussed.

169 New York, JTS, Mic. 2648 (Steinschneider 21), ff. 1r–4r (Italy, 1406) [IMHM F 28901]; Parma, Biblioteca Palatina, cod. 2100 (De Rossi 750, Richler 1344), ff. 96r–111r (Italy, 1412) [IMHM F 13176]; Paris, BNF, héb. 1065, ff. 36r–37r (Italy, 15 c.) [IMHM F 31301]; Verona, Biblioteca Civica, cod. 204 (82.4), ff. 102r–104v (Byzantium, 15 c.) [IMHM F 32678].

170 Preserved in two manuscripts: Paris, BNF, héb. 1091, ff. 102r–159v (Sephardi/Italy, 16 c.) [IMHM F 15042] and Paris, BNF, héb. 1033 (Italy, 17 c.) [IMHM F 15026]; see also Steinschneider, *HÜ*, p. 546; Sezgin, *GAS*, Vol. 7, p. 123.

171 Oxford, Bodleian Library, Hunt. 385 (Uri 452, Neubauer 2029; Orient, 18 c.) [IMHM F 19314]; Steinschneider, *HÜ*, p. 580.

172 David ben Yom Ṭov, *Kelal qaṭan*, ed. Gerrit Bos, Charles Burnett, and Y. Tzvi Langermann (Philadelphia: American Philosophical Society, 2005). The text has no title in the manuscripts.

173 Paris, BNF, héb. 1065, ff. 99r–104r (Sephardi, 1422) [IMHM F 31301]; Oxford, Bodleian Library, Mich. Add. 19 (Neubauer 2042), ff. 9v–11v (Sephardi/Provence, 15 c.) [IMHM F 19327]; St. Petersburg, Institute of Oriental Studies, C 76, ff. 164v–65v (Sephardi, 15/16 c.) [IMHM F 69233]. A fifth manuscript, not used for the Bos–Burnett–Langermann edition, is Vienna, ÖNB, cod. Heb. 195 (Schwartz 196), ff. 99r–100v (Italy, 17 c.) [IMHM: F 1457].

174 *Kelal qaṭan*, ed. Bos, Burnett, and Langermann, pp. 63–82.

175 See supra (p. 279) the subsection: Commentaries on Ibn Ezra's Astrological Encyclopedia(s).

176 Cambridge, UL, Add. 1563.2 (SCR 597), ff. 104v–106r (Italy, 16 c.) [IMHM F 17475].

177 Cf. Goldstein, "Levi ben Gerson's Astrology"; Goldstein and Pingree, "Levi ben Gerson's Prognostication."

(Orange),[178] which also includes a very popular piece commenting on Abraham Ibn Ezra's *Balances of Enoch.*

During the Renaissance, a number of manuscripts were produced that document the activities of individual scholars rather than widespread traditions. One of these figures is David ben Jacob Meir Qalonymos, who was court physician in Naples in the second half of the fifteenth century and later moved to Venice. He wrote two astrological treatises, one on the Great Conjunction (*Horaʾat ha-dibbuq he-ʿaṣum mi-Šabbetai we-Ṣedeq ʿal haṣmaḥat yešuʿato we-ʿal bet ʾadoni ha-melek̲*)[179] and the other on the astrological effects or actions of the planets (*Kok̲evei ha-lek̲et u-feʿullatam*).[180] Two of his sons, Qalonymos ben David and Ḥayyim ben David, and Qalonymos's son-in-law Elijah Ḥalfon were also practicing astrologers. Two manuscripts contain collections of their own works and excerpts they made from other scholars' writings.[181]

In Candia (Crete) in the eastern Mediterranean, the German émigré Moses ben Samuel Kohen Ashkenazi (second half of the fifteenth century)[182] wrote a book on astrology, *Urim we-tummin*, which is extant in one autograph manuscript.[183] This work displays the author's enormous erudition in both the philosophical and technical aspects of astrology.[184]

Many Hebrew manuscripts contain hard-to-date and -locate translations of astrological works attributed to the classical Greek and Arabic authorities. I have already mentioned the translations of Māshāʾllāh's *Sefer ha-Šeʾelot* and *Sefer be-Qadrut ha-levanah we-ha-šemeš*, as well as Pseudo-Ptolemy's *Sefer ha-Šeʾelot* and *Sefer ha-Mivḥarim*, which became part of the corpus of Abraham Ibn Ezra's astrological writings.[185] To these one should add a translation from the Arabic of Abū Maʿshar's *Book of Elections*, found in a single fifteenth-century Italian manuscript. Because it is followed by Qalonymos ben Qalonymos's translation of the *Centiloquium* (*Sefer ha-Peri*),[186] and Qalonymos is one of the few translators known to have translated astrological texts from Arabic into Hebrew, it is possible that he also produced the Hebrew

[178] Budapest, Magyar Tudományos Akadémia, Kaufmann A 508, pp. 604–35 (Italy, 16 c.) [IMHM F 14992]; New York, JTS, Mic. 2550, ff. 82v–83r (Sephardi, 15 c.) [IMHM F 28803]; Paris, BNF, héb. 1054, f. 31r–v (Italy, 15 c.) [IMHM F 33997]; Naples, Biblioteca Nazionale Vittorio Emanuele, III F 12, ff. 98v–102r [IMHM F 11526]; New York, JTS, Mic. 2601, f. 152r–v (Italy/Sephardi-Provençal, 15 c.) [IMHM F 28854]; Paris, BNF, héb. 903, ff. 36r (Ashkenaz, 15 c.) [IMHM F 26859]; Vatican, Bibliotheca Apostolica, ebr. 477, ff. 24r–27v (Italy, 16/17 c.) [IMHM F 530], Paris, BNF, héb. 1048, ff. 110r–112r (Italy, 15 c.) [IMHM F 31659]; Parma, Biblioteca Palatina, cod. 2637 (De Rossi 336, Richler 1493), ff. 16r–24v (Italy, 15/16 c.) [IMHM F 13553]; Oxford, Bodleian Library, Mich. 350 (Neubauer 2052), ff. 38v–45r (Italy, 15 c.) [IMHM F 19337]; Oxford, Bodleian Library, Reggio 44 (Neubauer 2050), ff. 2r–25v (Sephardi, 16 c.) [IMHM F 19335]; St. Petersburg, Russian National Library, Evr. I 545, ff. 17v–20r (Byzantium, 15 c.) [IMHM F 51284].

[179] Oxford, Bodleian Library, Reggio 42 (Neubauer 2244), ff. 72v–78v (Italy, 15 c.) [IMHM F 20527]; Vatican, Bibliotheca Apostolica, ebr. 105, ff. 307v–309v (Byzantium, 15 c.) [IMHM F 217].

[180] Budapest, Magyar Tudományos Akadémia, Kaufmann A 508, pp. 590–5 (Italy, 16 c.) [IMHM F 14992].

[181] Parma, Biblioteca Palatina, cod. 2637 (De Rossi 336, Richler 1493; Italy, 15/16 c.) [IMHM F 13553]; Budapest, Magyar Tudományos Akadémia, Kaufmann A 508 (Italy, 16 c.) [IMHM F 14992]. On the latter manuscript cf. also Tamás Bíró, "A Renaissance Astrological Manuscript from the Kaufmann Collection," in É. Apor, ed., *David Kaufmann Memorial Volume* (Budapest: Library of the Hungarian Academy of Sciences, 2002), pp. 41–59.

[182] For biographical data see Ephraim Kupfer, "Concerning the Cultural Image of German Jewry and Its Rabbis in the Fourteenth and Fifteenth Centuries," *Tarbiz* 42 (1972/3): 113–47, on pp. 125–7 (in Hebrew); Ephraim Gottlieb, "*Wikkuaḥ ha-gilgul be-Qandia*," *Sefunot* 11 (1978): 45–66 (in Hebrew).

[183] Vatican, Bibliotheca Apostolica, ebr. 393, ff. 121r–239v (Byzantium, 15 c.) [IMHM F 516].

[184] Y. Tzvi Langermann has studied this text and presented some of his results in a paper given at the Ben-Zvi Institute on June 3, 2007.

[185] See above, the subsection: Ibn Ezra's Astrological Encyclopedia(s) as the Nucleus of Larger Compilations of Hebrew Astrological Texts (Thirteenth and Fourteenth Centuries).

[186] Leiden, Bibliotheek der Rijksuniversiteit, cod. or. 4731, pp. 86–90 [IMHM F 19186]; cf. also Steinschneider, *HÜ*, p. 571. I could not check whether this text is identical with any of those given under this title in Sezgin, *GAS*, Vol. 7, p. 146.

version of Abū Maʿshar's treatise attested in this manuscript, a hypothesis that remains to be verified. Selections from the Latin *Flores* of Abū Maʿshar were translated into Hebrew at an unknown date.[187] A popular text attributed to Abū Maʿshar is *Sefer ha-mazzalot*, printed in Ferrara in 1556/7.[188] An undated anonymous Hebrew translation of a work by Sahl ben Bishr, under the title *Kelalim* (Rules), is attested in a single manuscript.[189]

ASTROLOGICAL MANUSCRIPTS IN JUDEO-ARABIC AND OTHER LANGUAGES IN HEBREW SCRIPT

Works of science were occasionally copied by Jews in their original languages but in Hebrew script. Moritz Steinschneider initiated the study of these manuscripts more than a hundred years ago; Y. T. Langermann continued it in the late 1990s, concentrating on Arabic scientific texts.[190] However, only a small fraction of the titles listed by these two scholars belong to the field of astrology. Clearly, transcribing Arabic astrological works in Hebrew letters was never a very widespread practice. Moreover, there are very few examples of an *internal* transmission of astrological texts in Arabic in Jewish manuscripts; hence almost all the extant manuscripts have to be regarded as unique documents testifying to the scholarly interests of their copyists, who used *Vorlagen* in Arabic script. Consequently, the significance of these manuscripts for the history of Jewish astrology must not be overestimated.

An interesting early example of an Arabic astrological text copied in Hebrew script is a late medieval Iberian manuscript of the commentary on Ptolemy's *Tetrabiblos* by ʿAli ben Riḍwān (d. 1061).[191] The manuscript consists of two parts: an incomplete copy of the work in Arabic script, followed by a second part (fourteenth century), in Hebrew letters, that completes the missing passages of the text in Arabic script.[192] The "complement" in Hebrew script, as well as the Hebrew glosses in the margins of both parts of the manuscript, provide vivid testimony that a Jewish scholar of the fourteenth or fifteenth century studied this book intensively.

A fifteenth-century Oriental manuscript[193] contains al-Qābiṣī's *Kitāb al-Mudẖal ilā ʿilm al-nuǧūm* (Introduction to the Science of the Stars) in Hebrew script.[194] It is totally independent of another copy of the same book, produced in the Maghreb in the seventeenth or the eighteenth century,[195] which contains also two other Arabic works by Sahl ben Bishr[196] and a few astronomical texts.[197] A third, independent fragmentary copy is found in a

[187] Parma, Biblioteca Palatina cod. 2112 (De Rossi 1181, Richler 1488), ff. 51v–53v (Sephardi/Provence, 14/15 c.) [IMHM F 13331].

[188] See the following section: Astrological Manuscripts in Judeo-Arabic and Other Languages in Hebrew Script.

[189] Jerusalem, JNUL, 38° 5563 [IMHM B 874]; cf. Steinschneider, *HÜ*, p. 604–7.

[190] Cf. Moritz Steinschneider, "Schriften der Araber in hebräischen Handschriften, ein Beitrag zur arabischen Bibliographie," *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 47 (1893): 335–84; Y. Tzvi Langermann, "Arabic Writings in Hebrew Manuscripts: A Preliminary Relisting," *Arabic Sciences and Philosophy* 6 (1996): 137–60.

[191] Cf. Sezgin, *GAS*, Vol. 7, p. 44.

[192] MS Escorial, Biblioteca de San Lorenzo de El Escorial, Nr. 913, ff. 128r–161v [IMHM F 71969], contains the eleventh and twelfth *maqāla*. It should be noted, however, that the pages of the entire manuscript are out of order. On this manuscript see also Steinschneider, "Schriften der Araber," p. 363; *HÜ*, p. 526 (there called Esc. 908).

[193] Oxford, Bodleian Library, Hunt. 582 (Uri 453, Neubauer 2081), ff. 19r–61v [IMHM F 19366].

[194] Cf. Sezgin, *GAS*, Vol. 7, pp. 170–1.

[195] Moscow, Russian State Library, Guenzburg 813, ff. 1r–15v [IMHM F 47996].

[196] Ibid., ff. 41r–47v and 47v–50r [IMHM F 47996]; cf. Sezgin, *GAS*, Vol. 7, p. 125.

[197] Cf. Steinschneider, *HÜ*, p. 604; idem, "Schriften der Araber," p. 351; Langermann, "Arabic Writings," p. 154; *Al-Qabīṣī (Alcabitus): The Introduction to Astrology*, ed. and trans. Charles Burnett, Keiji Yamamoto, and Michio Yano (London: Warburg Institute, 2004), p. 16.

manuscript written in 1562 in the Orient (Persia?),[198] which also preserves an astrological treatise by ʿAbdallāh ben Masrūr.[199] An Arabic commentary on the *Madẖal fī ṣināʿat aḥkām al-nuǧūm* (Introduction to the Art of Astrology), by Kūshyār ben Labbān, is probably erroneously attributed to a certain David al-Ḥarizi in an eighteenth-century manuscript from the Maghreb.[200]

The small number of Arabic astrological manuscripts in Hebrew script makes is difficult to draw any general conclusions regarding their quantitative diffusion and cultural significance in specific regions and periods. It seems, however, that Yemenite Jews were more productive in this field than those from other parts of the Arabic-speaking Diaspora. Yemenite Arabic astrological manuscripts include Kūshyār ben Labbān's *Madẖal* (previously mentioned) in Hebrew script[201] and fragments from al-Bīrūnī's *Tafhīm fī ṣināʿat al-tanǧīm* (Instruction in the Art of Astrology).[202] Moreover, Yemen is also the country where we find the only example of an Arabic astrological text transmitted internally in Jewish manuscripts. Numerous astrological appendices to Yemenite prayer books and various other manuscripts contain a section on the stations of the moon (*manāzil al-qamar*) taken from the *Letters of the Brethren of Purity* (*Rasāʾil Iẖwān al-ṣafāʾ*).[203]

Largely untapped sources for the history of Arabic-language astrological literature in Hebrew characters are the Judeo-Arabic manuscripts of the Firkovich collection in St. Petersburg and in the Geniza collection at the Cambridge University Library. Little systematic research has been done on this material, although a number of Arabic and Judeo-Arabic horoscopes and almanacs[204] and one text of popular astrology[205] have been investigated and published. A preliminary survey of these manuscript collections, which I conducted recently, suggests that they do not include material that would necessitate a serious modification of the picture that can be gained from other manuscript collections.

Generally speaking, the Arabic astrological works transcribed in Hebrew letters reveal nothing unexpected. Most of the authors attested in these manuscripts, such as Abū Maʿshar, Kūshyār Ibn Labbān, and al-Qabīṣī, are among the classics of Arabic astrological literature. These works are preserved in numerous manuscripts in Arabic script in libraries all over the world. That these authors were popular among Jews can be confirmed by the book lists found in the Cairo Geniza, which give evidence that the same works (in whatever script) were owned and presumably also read by Jews.[206]

[198] Oxford, Bodleian Library, Hunt. 224 (Uri 442, Neubauer 2064), ff. 27v–55v (al-Qabīṣī, end of chapter 2 to end of the book) and 56r–62v (Ibn Masrūr) [IMHM F 19349]. The texts copied on other pages of the manuscript seem to be taken from the *Iẖwān al-Ṣafāʾ*. This manuscript is not mentioned among the Judeo-Arabic witnesses in *Al-Qabīṣī*, ed. Burnett, Yamamoto, and Yano, pp. 16 and 504.

[199] Cf. Sezgin, *GAS*, Vol. 7, p. 166.

[200] Jerusalem, JNUL, 38° 5563, ff. 1r–73r [IMHM B 874].

[201] New York, JTS, Mic. 2584 [IMHM F 28837]. Cf. Sezgin, *GAS*, Vol. 7, pp. 182–3; *Kūšyār Ibn Labbān's Introduction to Astrology*, ed. and trans. Michio Yano (Tokyo: Institute for the Study of Languages and Cultures of Asia and Africa, Tokyo University, 1997).

[202] Langermann, "Arabic Writings," p. 146.

[203] Cf. ibid., p. 150; Leicht, *Astrologumena Judaica*, pp. 177–84.

[204] Bernard R. Goldstein and David Pingree, "Horoscopes from the Cairo Geniza," *Journal of Near Eastern Studies* 36 (1977): 113–44; idem, "Astrological Almanacs from the Cairo Geniza," *Journal of Near Eastern Studies* 37 (1979): 153–75 and 231–56; idem, "More Horoscopes from the Cairo Geniza," *Proceedings of the American Philosophical Society* 125 (1981): 155–89; idem, "Additional Astrological Almanacs from the Cairo Geniza," *Journal of the American Oriental Society* 103 (1983): 673–90; Paul B. Fenton, "Les manuscrits astrologiques de la *Guenizah* du Caire," in Halbronn, *Le monde juif et l'astrologie*, pp. iii–xix (appendix).

[205] Shaul Shaked, "A Palestinian Jewish Aramaic Hemerologion," *Jerusalem Studies in Arabic and Islam* 15 (1992): 28–42.

[206] Allony, *The Jewish Library*, pp. 203 (Abû Maʿshar, No. 46:84), 244 (al-Qabīṣī, No. 64:59), 351 (Sahl b. Bishr, No. 98:128), but also 157 (Māshāʾllāh, No. 40:8).

Scientific astrological books in languages other than Arabic were occasionally transcribed in Hebrew letters, too. These works are mainly attested in a small number of manuscripts from the Iberian Peninsula. A fifteenth-century manuscript now in Vienna[207] contains Spanish versions of a treatise on the astrolabe, a Spanish version of al-Qabīṣī's *Kitāb al-Madḫal ilā ʿilm al-nuǧūm*, and the Alfonsine *Libro de las Cruzes.*[208] Similarly, excerpts from Spanish and Portuguese versions of Abū l-Ḥasan Ibn Abī al-Riǧāl's *Kitāb al-Bāriʿ* were copied in two fifteenth-century manuscripts.[209] A Portuguese translation of the *Centiloquium/Liber fructus* was added to a collection of Hebrew astrological works by a Sephardi scribe of the fifteenth or sixteenth century.[210] This is quite revealing, inasmuch as it indicates that the Hebrew translations of this text by Jacob en Elijah and Qalonymos ben Qalonymos were probably not universally available at this time.

COLLECTIONS OF POPULAR ASTROLOGY

Collections of popular astrological texts can be distinguished from astrological works in the scientific scholarly tradition by the fact that their use requires a minimum of astrological knowledge. Such collections are transmitted either as parts of manuscripts that also contain other texts or independently. Popular astrological texts almost never appear together with higher, "scientific" astrological literature. It is rather in liturgical manuscripts and calendrical handbooks from medieval Germany, France, and Italy that we find the most valuable treasures of Jewish traditions of popular astrology.[211] One of these texts, a combined brontologion and seismologion (dealing, respectively, with thunder and earthquakes), is attested in various manuscripts under the title *Seder Reʿašim u-reʿamim*; it was printed as early as 1568 and later appended to the *Maḥzor Romania.*[212] Similar collections of popular astrological texts can be found together with aggadic and halakhic material in appendices added by later scribes to an ethical work like *Sefer Maʿalot ha-middot* by Jeḥiel ben Jequtiel ha-Rofé,[213] Rashi's commentary on the Hagiographa,[214] and Baḥya Ibn Paquda's *Sefer Ḥovot ha-levavot.*[215] Manuscripts of mystical works occasionally contain sections on popular astrology, too.[216]

[207] Vienna, ÖNB, cod. Heb. 48 (Schwartz 199) [IMHM F 1325].

[208] Cf. *Alfonso el Sabio, Libro de las Cruzes*, ed. L. A. Kasten and L. B. Kiddle (Madrid: Madison, 1961); Manfred Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden: Brill, 1972), p. 341; cf. also Leicht, *Astrologumena Judaica*, p. 158 n. 170.

[209] Oxford, Bodleian Library, Laud. Or. 310 (Uri 435, Neubauer 2031; Spain, 1411) [IMHM F 19316]; Vatican, Barberini, Or. 155, ff. 5r–19r (Spain, 15 c.) [IMHM F 74200]. Cf. also I. González Llubera, "Two Old Portuguese Astrological Texts in Hebrew Characters," *Romance Philology* 6 (1953): 267–72.

[210] St. Petersburg, Institute of Oriental Studies, C 76, ff. 142r–163r [IMHM F 69233].

[211] See above, the section: The Survival of Palestinian Jewish Astrological Traditions in Ashkenaz and the Beginnings of Astrological Literature in Northern Europe.

[212] Cf. Hermann Pick, "Über das Buch 'Von den Erdbeben und Donnern': ספר רעשים ורעמים und seinen Quellen," *Soncino-Blätter* 3 (1929/39): 129–37 (= pp. 53–61); Leicht, *Astrologumena Judaica*, pp. 133–4.

[213] Paris, BNF, héb. 716, ff. 297v–299v [IMHM F 27764]; cf. Leicht, *Astrologumena Judaica*, pp. 130–1. Similar collections can be found in Frankfurt a. M., Stadt- und Universitätsbibliothek, Heb. oct. 29 (Róth/Striedl 29) [IMHM F 4237], and London, Montefiore Library, 431 (H. No. 188), ff. 83r–84v [IMHM F 8756].

[214] Vatican, Bibliotheca Apostolica, ebr. 285, ff. 101r–108v [IMHM F 8632].

[215] New York, JTS, Mic. 2242, ff. 1v–2r [IMHM F 28495].

[216] London, British Library, Add. 27,064 (Margoliouth 777), ff. 216v–218r [IMHM F 5744]; Munich, Bayerische Staatsbibliothek, cod. Heb. 112, ff. 222v–223v [IMHM F 1144]; Frankfurt a. M., Stadt- und Universitätsbibliothek, Heb. oct. 18 (Róth/Striedl Nr. 18), ff. 168r–171r [IMHM F 4226]; Oxford, Bodleian Library, Opp. 506 (Neubauer 1812), ff. 208r–209r [IMHM F 18104]; Oxford, Bodleian Library, Opp. 603 (Neubauer 2287), ff. 101r, 104r, and 157r–161r [IMHM F 20979]; cf. Leicht, *Astrologumena Judaica*, pp. 135–6 and 148–52.

Most of the collections mentioned here originated in late medieval and early modern Germany and Italy; surprisingly little can be said about the Provençal and Spanish traditions of popular astrology. Only three manuscripts that contain substantial portions of popular astrology have been identified and can be attributed to the Spanish legacy.[217] Occasional contacts notwithstanding, these collections of texts indicate that the astrological traditions of medieval Ashkenaz (many of which, as we saw, ultimately go back to Late Antiquity) were virtually unknown in medieval Spain, where other, mostly Arabic, traditions were predominant.[218]

Jewish culture in the Iberian Peninsula seems to have made two main contributions to Hebrew astrological literature. The first is the creation of manuscripts that contain popular astrological texts side by side with books for casting lots (*sifrei goralot*). *Goralot*-books have their origin in Late Antiquity and are also widely attested in the Cairo Geniza. However, the "classic" Jewish works of this genre, which circulated under titles like *Urim we-tummim* or were attributed to Abraham Ibn Ezra, Saadia Gaon, and, later, Ḥayyim Vital, are not attested earlier than the fifteenth century.[219] In various manuscripts they were combined with texts for casting simple horoscopes according to the twelve zodiacal signs, a method that does not operate with the real date of birth but depends on calculations based on the numerical value of the names of the petitioner and his mother or father. The most popular of these *mazzalot*-texts was printed in 1556/7 in Ferrara as *Sefer ha-Mazzalot mi-ʾAlbumaṣar ha-yišmeʿeli* (Book of Zodiacal Signs of Albumaçar [Abū Maʿshar] the Ishmaelite). As a result of their enormous circulation, primarily in Sephardi but later also in Ashkenazi manuscripts, such lot and horoscope books exist in many different recensions. They have yet to be systematically analyzed.[220]

The second innovation of the Sephardi tradition is smaller booklets, mainly from North Africa and the Orient (seventeenth to twentieth centuries), that are collections of astrological almanacs and similar popular texts. One book of this genre, which was widely disseminated, is *Sefer Belʿi*, attested in more than thirty Hebrew manuscripts and a number of Judeo-Arabic, Judeo-Persian, and modern Aramaic translations. The future will undoubtedly bring more copies of this book to light, after manuscripts, still often in the private ownership of Oriental Jews, become available for research. They demonstrate the continuous popularity of this book among Oriental Jews well into the twentieth century. The kabbalist Abraham Ḥamawi included *Sefer Belʿi* in the collection of magical texts published as *Sefer Daveq me-ʾaḥ* (Livorno, 1875).[221]

Another work of popular astrology, often copied and eventually printed, is that attributed to Isaac Luria. This *Sefer Simanei reʿašim u-reʿamim we-liqqui meʾorot* was first printed in Constantinople in 1710 as an appendix to the polemical collection *Milḥemet ḥovah*. It was subsequently reprinted dozens of times in Eastern Europe. A Judeo-Arabic version of cognate texts was printed under the title *Sefer ʾOtot ha-šamayim* in the 1868 Livorno edition of *Sefer Šaaʿšuʿim* by Elijah ben Joseph Gig.[222]

[217] Vatican, Bibliotheca Apostolica, ebr. 290, ff. 1r–4v [IMHM F 346]; Munich, Bayerische Staatsbibliothek, cod. Heb. 228, ff. 33r–34v, 43r–v, and 100r–115v [IMHM F 1259]; Munich, Bayerische Staatsbibliothek, cod. Heb. 289, ff. 138r–144r [IMHM F 1607].

[218] Cf. Leicht, *Astrologumena Judaica*, pp. 152–67.

[219] On this literature see E. Burkhardt, "Hebräische Losbuchhandschriften: Zur Typologie einer jüdischen Divinationsmethode," *Jewish Studies between the Disciplines*, ed. Klaus Herrmann, Margarete Schlüter, and Giuseppe Veltri (Leiden: Brill, 2003), pp. 95–148.

[220] Cf. Leicht, *Astrologumena Judaica*, pp. 165–7. An edition of an incunabulum of a very similar text in Catalan was recently published by John Scott Lucas, *Astrology and Numerology in Medieval and Early Modern Catalonia* (Leiden: Brill, 2003).

[221] Cf. also Leicht, *Astrologumena Judaica*, pp. 168–71.

[222] Cf. ibid., pp. 171–4.

The three extant Judeo-Arabic versions of *Malḥamat Daniyāl* were never printed.[223] One of them is attested exclusively in manuscripts from Yemen;[224] a much more popular version, to which short texts attributed to Abba Saul are often appended,[225] is attested in numerous Oriental manuscripts. One version in an eighteenth- or nineteenth-century manuscript attests a Judeo-Arabic version that is based on the Coptic names of the months. The diffusion of a small collection attributed to the kabbalist Judah Alcorsono (fourteenth century) seems to be restricted to North Africa in the eighteenth and nineteenth century.[226]

Yemenite liturgical manuscripts from the seventeenth century onward often contain appendixes with popular astrological texts in Hebrew and Judeo-Arabic. The texts are mainly drawn from European and Muslim sources.[227] Occasionally, these collections were also copied independently.[228]

Books on magic, printed in Central and Eastern Europe in the early modern period, often contain astrological sections, too. The material transmitted in these books has never been studied systematically, but a preliminary survey indicates that older "Jewish" traditions intermingle with material adapted from the surrounding cultures. Two examples of such collections are *Sefer Zeḵirah* by Zechariah ben Jacob Simner (Hamburg, 1709) and *Sefer Šošannat Yaʿaqov* by Jacob ben Mordecai of Fulda (Amsterdam, 1706).

HEBREW LITERATURE ON ASTRAL MAGIC

Astral magic is a distinct aspect of the astrological Weltanschauung, which in the Middle Ages existed side by side with judicial astrology. Although astral magic and judicial astrology are based on common principles and share a number of basic ideas, texts on the two subjects are almost never found in the same manuscripts. In the manuscript tradition, astral magic had a clear affinity with magic and medicine, whereas judicial astrology always maintained close ties to astronomy.

The separate textual transmission is conspicuous, because it indicates the degree to which the Middle Ages did not see judicial astrology and astral magic as part of the same science and professional practice. Moreover, this separation is not limited to scribal practice; it can also be found in tractates on the "enumeration of the sciences," which were composed in Arabic and Latin from the tenth and eleventh centuries onward. Al-Fārābī briefly mentions astrology alongside astronomy among the mathematical sciences in his *Iḥṣāʾ al-ʿulūm* (Enumeration of Sciences),[229] but he does not count medicine, let alone astral magic, among the sciences at all.[230] It is not until a century later that we find a clear statement about "medicine, talismans, enchantments, magic etc." as part of the natural sciences, in al-Ghazālī's *Maqāṣid*

[223] Cf. ibid., pp. 175–6. On this text see now also Lorenzo DiTommaso, *The Book of Daniel and the Apocryphal Daniel Literature* (Leiden: Brill, 2005), pp. 283–98 and 472–81.

[224] Cf. also Yosef Tobi, *The Jews of Yemen* (Leiden: Brill, 1999), pp. 242–54.

[225] Cf. Leicht, *Astrologumena Judaica*, pp. 465–6.

[226] Cf. ibid., pp. 174–5.

[227] Modern printed editions of the Yemenite *Tiklal* normally omit the astrological appendices, but they can be found, e.g., in the *Tiklal Jerusalem* of the year 1888/9, ed. S. Garami and S. Zucker, ff. 158v, 173r–184v.

[228] Cf. Leicht, *Astrologumena Judaica*, pp. 183–4.

[229] Al-Fārābī, *Iḥṣāʾ al-ʿulūm*, in al-Fārābī, *Catálogo de la Ciencias*, ed. and trans. A. González Palencia, 2nd ed. (Madrid: Publicaciones de la Facultad de filosofia y letras Universidad de Madrid, 1953), pp. 66–9 (in Arabic).

[230] On the systematic reasons for this decision, see F. Schupp in his introduction to al-Fārābī, *Über die Wissenschaften* (Hamburg: Felix Meiner, 2005), pp. XLII–XLIV. The Latin enumeration of sciences attributed to al-Fārābī, under the title *De ortu scientiarum*, reflects later medieval developments, although H. A. Wolfson seems to believe in its authenticity; see "The Classification of Sciences in Mediaeval Jewish Philosophy," *Hebrew Union College Jubilee Volume* (Cincinnati: Hebrew Union College, 1925), pp. 263–315, on p. 297.

al-falāsifa (Intentions of the Philosophers);[231] however, they are still clearly distinguished from astronomy and other mathematical sciences.

Al-Ghazālī's book was among the first Arabic philosophical works to be translated into Latin, in twelfth-century Toledo;[232] hence he can be seen as a mediator for the transmission of this concept to medieval Latin authors like the Toledan philosopher Dominicus Gundissalinus, who seems to have been the first medieval Christian scholar to adopt this system.[233] It is conspicuous that few later enumerations of the sciences, in both Latin and Hebrew, ignore astral magic, which gives us clear evidence for the importance of this topic in intellectual discourse. Astrology and astral magic, however, were always kept as distinct branches of science. Among Jewish authors who adopted this distinction, one may cite Shem Ṭov ben Joseph Ibn Falaquera, who wrote about the two subjects separately in his introduction to the sciences, *Reʾšit ḥok̲mah*.[234] In contrast, the translator Qalonymos ben Qalonymos may seem to be a bit exceptional in this respect, in that he added a passage on astral magic at the end of the chapter on the mathematical sciences in his Hebrew version of al-Fārābī's *Iḥṣāʾ al-ʿulūm*.[235] Even there, however, he kept it clearly separate from astronomy and astrology and declared it to be part of the "experimental" (or rather "manipulatory") sciences (*taḥbulot*).

Finally, on a theoretical level, during the Middle Ages the rejection or acceptance of one of them – astrology or astral magic – did not necessarily imply the rejection or acceptance of the other. Judicial astrology was open to religious objections related to ethical questions, determinism, and free will, whereas practices of astral magic could be criticized as too close to pagan star cults and the adoration of the so-called intermediary beings – and thus as akin to idolatry. Only a few medieval scholars rejected both in equally harsh terms; one such example is Maimonides, who subjected both branches of astrological beliefs and practices to a systematic critique in his writings.[236] On the other side, Abraham Bar Ḥiyya is a brilliant example of a Jewish scholar who embraced judicial astrology but strictly rejected any practice of astral magic.[237] Thus, if one includes a section on astral magic in this outline of the history of astrological literature, it is with the strong caveat that this is a concession to the categories of modern scholarship rather than a true representation of medieval conceptions.

[231] Al-Ghazzālī, *Maqāṣid al-falāsifa*, ed. A. F. al-Mazīdī (Beirut: Dār al-Kutub al-ʿIlmiyya, 2003), p. 66 (second book, second prologue).

[232] Cf. M. Alonso, "Traducciones del Arcediano Domingo Gundisalvo," *Al-Andalus* 12 (1947): 295–338, on pp. 331–3; D. Salman, "Algazel et les Latins," *Archives d'histoire doctrinale et littéraire du Moyen Age* 10/11 (1035/1936): 103–27, and (partial edition) *Algazel's Metaphysica: A Medieval Translation*, ed. J. T. Muckle (Toronto: St. Michael's College, 1933), on p. 4.

[233] In his *De divisione philosophiae*, Dominicus Gundissalinus mentions the following natural sciences, namely sciencia de medicina, sciencia de indiciis [*sic*], sciencia de nigromantia secundum physicam, sciencia de imaginibus, sciencia de agricultura, sciencia de nauigacione, sciencia de speculis, and sciencia de alquimia – see ed. L. Baur (Münster: Aschendorffsche Buchhandlung, 1903), p. 20 – but he deals with *astrologia* and *astronomia* independently in a later part of the book (ed. Baur, pp. 115–19 and 119–21). For his sources see also C. Burnett, "A New Source for Dominicus Gundissalinus's Account of the Science of the Stars?" *Annals of Science* 47 (1990): 361–74. To the same tradition belong Ps.-Al-Fārābī *De ortu scientiarum*, ed. C. Baeumker, *De ortu scientiarum* (Münster: Aschendorffsche Buchhandlung, 1916), pp. 18 and 20, and G. Maurach, "Daniel of Morely, *Philosophia*," *Mittellateinisches Jahrbuch* 13 (1979): 204–52, esp. 239.

[234] Shem Ṭov b. Joseph Falaquera, *Reʾšit ḥok̲mah*, ed. M. David (Berlin: M. Poppelauer 1902), pp. 45–6 and 52–3.

[235] Qalonymos ben Qalonymos, *Maʾamar be-mispar ha-ḥok̲mot*, in Mauro Zonta, ed. and trans., *La "Classificazione delle Scienze" di Al-Fārābī nella Tradizione Ebraica* (Turin: Silvio Zamorani, 1992), pp. 21–2 (trans., p. 84). On magic see also pp. 28–9 (trans., pp. 93–4).

[236] Langermann ("Maimonides' Repudiation") implicitly also argues for an inner connection between Maimonides' refutation of astral magic and astral determinism.

[237] Bar Ḥiyya, *ʾIggeret*, pp. 31–3.

The earliest Hebrew text that combines astrology with magical practice is preserved in the first part of *Sefer Razi'el*,[238] whose origins go back to the eastern Mediterranean, where we find the first traces of it in the ninth to tenth century. It is possible that it came into being in a cultural milieu where Syriac, Arabic, and Jewish traditions merged into various forms of esoteric lore.[239] From a quantitative point of view, *Sefer Razi'el*, in its various redactional forms, is one of the most widespread books of Jewish magic: It is attested in numerous manuscripts from the Cairo Geniza,[240] late medieval Spain, early modern Central Europe,[241] and Yemen. The status of *Sefer Razi'el* as part of the legacy of astral magic is, however, complicated. In its original form, the relevant sections of *Sefer Razi'el* display a peculiar concept of magical names (and angels) for cosmological and calendrical entities, such as the seasons, signs of the zodiac, planets, months, days of the week, elements, winds, and so on, which change according to specific times. Only in later additions to the *Razi'el* material do we also find material on writing (astrological) amulets.[242] In this sense, the astral magic in *Sefer Razi'el* is clearly to be distinguished from the astromagical concepts predominant in the "classical" texts on this topic, which are discussed in subsequent text. Consequently, it is not accidental that D. Schwartz has never mentioned this book in his numerous studies of the philosophical and legal disputes on astral magic in the Jewish Middle Ages.

Nevertheless, some of the materials originally found in the *Sefer Razi'el* were later translated into Arabic, Greek, and Latin and became inseparable parts of various works that clearly belong to the field of astromagical literature. One example is the hermetic *Book of the Moon* (*Muṣḥaf al-qamar, Liber lune*), which contains *Razi'el* traditions and was translated back into Hebrew twice under the title *Sefer ha-Levanah*.[243] The same holds true for the Latin *Liber Razielis*, which is based on a medieval Latin translation of *Sefer Razi'el*, produced no later than the twelfth century. Subsequently, probably during thirteenth century,[244] it evolved into a full-fledged Latin encyclopedia of practical Hermeticism, which was translated back into Hebrew at least three times during the fifteenth and sixteenth centuries.[245]

Leaving aside astral magic in the specific form of *Sefer Razi'el*, we see that the first signs of a philosophical and theological interest in astral magic can be found in the writings of Judah Halevi, Abraham Ibn Ezra, and Maimonides. These scholars obviously had access to and used Arabic texts on astral magic. Maimonides even gives us a list of such works. In the third part of the *Guide*, he mentions astromagical tracts by the Sabeans; Ibn Waḥšiyya's *Nabatean Agriculture*; Pseudo-Aristotle's *Kitāb Istimāḫīs*; talisman books by Ṭumṭum, Hermes, and Aristotle; an obscure *Kitāb al-Sarb*; and, finally, a book on the *Degrees of the Spheres and the Rising Signs*.[246] He read all of them in Arabic, of course, and – quite significantly – says not a single word about the existence of any text in Hebrew. It is very likely that his silence about

[238] *Sefer Razi'el* (Amsterdam, 1701), ff. 4r–6v; for further astrological items, see ff. 34v and 41v.

[239] Cf. Leicht, *Astrologumena Judaica*, pp. 255–7.

[240] Cf., e.g., the fragments Cambridge, UL, T-S K 1.21, T-S NS 21.95, and N T.-S. NS 164.34; Oxford, Bodleian Library, Heb. 20 C./41; Paris, Mosseri Collection I,77 (formerly G 2, published in Mann, "The Karaite Settlement," pp. 91–2); cf. also Leicht, *Astrologumena Judaica*, pp. 207–17.

[241] On this strand of transmission, which ultimately yielded the version of the *editio princeps*, cf. B. Rebiger, "Zur Redaktionsgeschichte des 'Sefer Razi'el ha-Mal'akh,'" *Frankfurter Judaistische Beiträge* 32 (2005): 1–22.

[242] *Sefer Razi'el*, f. 41v.

[243] For more details, see in the sequel.

[244] Cf. Leicht, *Astrologumena Judaica*, pp. 257–90.

[245] Cf. the following manuscripts: New York, JTS, Mic. 8117 [IMHM F 11308]; Oxford, Bodleian Library, Uri 386 (Neubauer 1959) [IMHM F 19121]; Munich, Bayerische Staatsbibliothek, cod. Heb. 240 [IMHM F 23136]; and Munich, Bayerische Staatsbibliothek, cod. Heb. 311 [IMHM F 23138]. Also cf. R. Leicht, *Astrologumena Judaica*, pp. 331–41.

[246] Maimonides, *Dalālat al-ḥā'irīn*, III.29 and III.37.

Hebrew literature on astral magic is not the result of an intentional *damnatio memoriae* but rather reflects the fact that nothing of this kind existed at that date.

It seems to be the case that additional conditions had to be fulfilled before Jews started to translate such texts into Hebrew – conditions that were realized in the middle of the thirteenth century in Christian Spain, where Jews were much less familiar with the Arabic language and its literature. This is when we find the first attestations of the Hebrew translation of the *Book of the Moon*, in Naḥmanides' commentary on Deut. 18:9[247] and in a kabbalistic work by Abraham Eskira.[248] Their quotations prove that they used the same translation of that work, preserved in two Renaissance manuscripts. This *Sefer ha-Levanah* was produced by an anonymous translator, probably in thirteenth-century Spain, who used a Latin source that was in turn based on an Arabic version of the text.[249]

Familiarity with Hebrew texts on astral magic was still not very common among Jewish scholars in the late thirteenth and early fourteenth centuries. An example of this is the limited diffusion of *Sefer ha-Levanah.* Baḥya ben Asher (d. ca. 1340), a student of Naḥmanides' of the second generation, obviously no longer had direct access to it: Writing about Naḥmanides' commentary on Deut. 18:9, he had to quote from another Arabic work, the *Letter of Balinus*, which he himself translated into Hebrew, in order to elucidate Naḥmanides' explanation.[250]

Even Solomon ben Adret (1235–1310), a first-generation student of Naḥmanides', and his contemporary Abba Mari of Lunel had to rely largely on hearsay when they discussed the halakhic permissibility of astrological amulets, until the latter finally found a copy of *Sefer Ṣurot šeneim-ʿaśar mazzalot* (Book of the Forms of the Twelve Signs of the Zodiac).[251] J. Shatzmiller discovered this text many years ago in the University Library at Cambridge; more recent research has identified two different Hebrew versions of this text, appearing under various titles in five different redactions. They are attested in no fewer than nine manuscripts from the late fourteenth to the seventeenth century, most of them from Italy.[252]

It thus becomes clear that most of the other Hebrew translations of books on astral magic were products of the late thirteenth and the fourteenth centuries. At least some of

[247] Naḥmanides, *Perušei ha-Torah*, ed. Ḥ. D. Chavel (Jerusalem: Mosad ha-Rav Kook, 1960), 2.427.

[248] The only extant manuscript is Moscow, Russian State Library, Guenzburg 607 [IMHM F 4192], where extensive quotations from *Sefer ha-Levanah* are found on ff. 71r–72v.

[249] Florence, Biblioteca Medicea Laurenziana, Plut. 88.55, ff. 96r–101v [IMHM F 44229]; Paris, BNF, héb. 849, ff. 64v–66v [IMHM F 14478]. Cf. F. Lelli, "Le Versioni Ebraiche di un Testo Ermetico: Il Sefer ha-Levanah," *Henoch* 12 (1990): 147–64; Leicht, *Astrologumena Judaica*, pp. 300–6.

[250] Baḥya ben Asher, *Beʾur ʿal ha-Torah*, ed. Ḥ. D. Chavel (Jerusalem: Mosad ha-Rav Kook, 1968), 3: 361 (on Deut. 18:10–11). The name גאלינוס (Galenus), found in the edition, should be emended to באלינוס (Balinus = Apollonius of Tyana).

[251] Cf. J. Shatzmiller, "In Search of the 'Book of Figures': Medicine and Astrology in Montpellier at the Turn of the Fourteenth Century," *Association for Jewish Studies Review* 7–8 (1982/3): 383–407; idem, "*The Forms of the Twelve Constellations*: A 14th-Century Controversy," *Shlomo Pines Jubilee Volume* (Jerusalem, 1990), Part 2, pp. 397–408 (in Hebrew); Schwartz, *Astral Magic*, pp. 219–61.

[252] Cambridge, UL, Add. 1741.2 (SCR 842), ff. 94v–97r (Italy, 14/15 c.) [IMHM F 17496]; New York, JTS, Mic. 8117, ff. 115v–117v and 138r–139r (Italy, 17 c.) [IMHM F 11308]; Oxford, Bodleian Library, Mich. 285 (Neubauer 2305), ff. 7r–11v (Italy, 16 c.) [IMHM F 20997]; Paris, BNF, héb. 1051, ff. 108r–110r and 110r–17r (Italy, 1482) [IMHM F 14656]; Mantua, Comunità Israelitica, ebr. 28, ff. 13v–15v (Italy, 16 c.) [IMHM F 808]; Livorno, Talmud Tora, Cod. 112, ff. 31r–34r (Italy, 16 c.) [IMHM F 12496]; New York, Lehmann, D 59, ff. 41r–43r (Ashkenaz, 19 c.) [IMHM F 72571]; Parma, Biblioteca Palatina, cod. 3729 (Tamani 49, Richler 1201), ff. 6r–7v (Italy/Sephardi, 14/15 c.) [IMHM F 27574]; Firenze, Biblioteca Medicea Laurenziana, 89 sup. 41, ff. 10v–8v [*sic*] (Italy/Ashkenaz, 16 c.) [no microfilm at IMHM]. See Leicht, *Astrologumena Judaica*, pp. 310–16; Reimund Leicht, "Le chapitre II:12 du *Picatrix* latin et les versions hébraïques du *De duodecim imaginibus*" (forthcoming).

them probably originated in Provence rather than in Spain. To this group belong *Sefer ha-Tamar* (Book of the Date Palm)[253] and the translation of Pseudo-Apollonius of Tyana's *Great Introduction to the Epistle on Talismans* (*Mavoʾ ha-gadol*),[254] both of which are first attested in the writings of authors from the Midi.

An important source for knowledge of Hebrew astromagical literature in this period is Levi ben Abraham ben Ḥayyim's aforementioned encyclopedia *Liwyat ḥen* (end of the thirteenth century), which became quite popular and had an enormous impact on later authors. Levi ben Abraham was acquainted with the *Great Introduction to the Epistle on Talismans* (*Mavoʾ ha-gadol ba-ṣurot*) by Pseudo-Apollonius of Tyana (Balinus)[255] and possibly also with *Sefer Šeneim-ʿaśar mazzalot* (Book of the Twelve Signs of the Zodiac).[256] Another Jewish scholar of this period, Nissim ben Moses of Marseilles (early fourteenth century), also used a translation of the *Book of the Date Palm* (*Sefer ha-Tamar*) on astral magic (he was also acquainted with Abraham Ibn Ezra's astrological works).[257]

A very famous though not necessarily widely read text of the Hebrew library of astral magic is the *Picatrix*, of which no fewer than four different Hebrew versions exist.[258] One of them, preserved in two Renaissance manuscripts, represents an abbreviated Hebrew version of the original Arabic text;[259] the others have come down to us in fragments only.[260] The date and place of composition of these translations require further investigation. It is unlikely that they were all produced as late as the sixteenth century, as has repeatedly been argued,[261] because the earliest translation, which bears the title *Taḵlit he-ḥakam*, is mentioned by Profiat Duran (d. ca. 1414) in the introduction to his grammatical work *Maʿaśeh ʾefod*.[262] Solomon Alconstantin (fourteenth to fifteenth century), a member of the "Neoplatonic circle,"[263] whose members were well known for their vivid interest in astrology and magic, mentions the *Picatrix*[264] alongside Ptolemy's *Tetrabiblos*[265] in his *Megalleh ʿamuqqot*.[266] It remains uncertain, though, whether he used the Arabic or Hebrew versions of these books. One might add

253 The text is attested in three manuscripts: Jerusalem, JNUL, Heb. 8° 151 [Scholem 28], ff. 82r–103r [IMHM B 245]; Paris, BNF, héb. 1016, ff. 19v–43r [IMHM F 15715]; and Munich, Bayerische Staatsbibliothek, cod. Heb. 214, ff. 1r–26v [IMHM F 1626]. It was published by Gershom Scholem in *Qiryat Sefer* 3 (1926): 181–222, and, with a German translation, as Abu Aflaḥ, *Sefer ha-Tamar* (Berlin: Orient-Buchhandlung Heinz Lafaire 1927); cf. Leicht, *Astrologumena Judaica*, pp. 306–8.

254 Preserved in three manuscripts: New York, JTS, Mic. 8117, ff. 105r–106v and 120v–138r [IMHM F 11308]; Paris, BNF, héb. 1016, ff. 1r–18v [IMHM F 15715]; Vienna, ÖNB, cod. Heb. 195 (Schwartz 196), ff. 123r–128v [IMHM: F 1457]; cf. also Leicht, *Astrologumena Judaica*, pp. 308–10.

255 See the quotation in Schwartz, *Astral Magic*, p. 246, where we find *Galenus* instead of *Balinus*.

256 Probably alluded to in a section quoted ibid., p. 250.

257 Cf. H. Kreisel's introduction to Nissim ben Moses of Marseilles, *Maʿaśeh Nissim* (Jerusalem: Mekişe Nirdamim, 2000), p. 5.

258 Cf. Leicht, *Astrologumena Judaica*, pp. 310–16.

259 Munich, Bayerische Staatsbibliothek, cod. Heb. 214, ff. 46r–101r [IMHM F 1626]; London, British Library, Or. 9861, ff. 1r–38v [IMHM F 6632].

260 New York, JTS, Mic. 2470 (ENA 2439), ff. 1r–10r [IMHM F 28723], and Mic. 2465 (ENA 1920), ff. 1r–14v [IMHM F 28723]; New York, JTS, Mic. 2470 (ENA 2439), ff. 10v [IMHM F 28723]; Oxford, Bodleian Library, Mich. 288, Ol. 176 (Neubauer 1352), ff. 171r [IMHM F 22378].

261 Hellmut Ritter and Martin Plessner, *"Picatrix." Das Ziel des Weisen von Pseudo-Maǧrîtî* (London: Warburg Institute, 1962), p. XI; Moshe Idel, "The Magical and Neoplatonic Interpretations of the Kabbalah in the Renaissance," pp. 107–69 in David B. Ruderman, ed., *Essential Papers on Jewish Culture in Renaissance and Baroque Italy* (New York: New York University Press, 1992), on p. 113 – originally published in *Jewish Thought on the Sixteenth Century*, ed. B. Cooperman (Cambridge, MA: Harvard University Press, 1983), pp. 186–242.

262 Profiat Duran, *Sefer Maʿaśeh ʾefod*, ed. J. Friedländer and J. Kohn (Vienna, 1865), p. 28.

263 For this term see Schwartz, *Jewish Neoplatonic Circle*, pp. 28–9.

264 See line 157. Alconstantin's use of the Arabic title may indicate that he used the Arabic original.

265 Cf. lines 25, 109, 135, 208, 233, 248, and 281.

266 Edited by Schwartz, "Solomon Alconstantin."

that Solomon Franco (mid-fourteenth century), who belonged to the same circle, refers his readers to the Pseudo-Aristotelian *Sefer ha-Temunot*.[267]

Italian Renaissance manuscripts contain a plethora of other texts dealing with astral magic. Among these are a Hebrew version of Pseudo-Ptolemy's *De imaginibus* (*Ma'amar Tolomeo ba-ṣurot*),[268] sections from the *Epistle of Aḥmad Ibn al-Jazzār* (*'Iggeret ʿAmit ben 'Ibrahim ha-ne'emar Ṭabbaḥ*),[269] a text explaining the astromagical uses of the Psalms,[270] and numerous tracts on astral talismans and planetary squares.[271] Most of these texts are attested in single manuscripts only, but a few seem to have had a somewhat wider circulation: a short epistle on the production of a talisman under the astral conjunction of Jupiter and Mercury,[272] a larger anonymous text on planetary squares,[273] and the late *Sefer ha-Kasdim*.[274]

The Hebrew translation of a version of Peter of Abano's *Heptameron*, entitled *Sefer ha-Ma'or*, does not predate the end of the seventeenth century. It was translated together with a *Sefer ha-Mazzalot* and the *Sefer ha-Levanah* – the second Hebrew translation of this work, which gained considerable popularity among modern scholars as a result of its publication by A. W. Greenup.[275] These texts, attested in three seventeenth-century manuscripts only,[276] belong to the Hebrew *Clavicula Salomonis* cycle.[277] The manuscripts, which were all written in northwestern Europe (London and Amsterdam), testify to a renewed interest in occult traditions adopted from Christian sources in the Renaissance and early modern Europe.

Finally, I should mention here a philosophical tract of which two chapters deal with matters of astral magic: *Sefer ha-ʿAṣamim* (Book of Substances), attributed to Abraham Ibn Ezra, which became enormously popular in the fifteenth, sixteenth, and seventeenth centuries. It is attested in at least thirteen Italian manuscripts. Quotations from this book by the fourteenth-century Jewish scholars Samuel Ṣarṣa and Samuel Moṭoṭ indicate, however, that it was produced – probably from an Arabic source – during the period when a renewed interest in the Neoplatonist philosophy of Abraham Ibn Ezra stimulated the demand for such texts.[278]

267 See Schwartz, *Amulets*, p. 346 n. 241; idem, *Jewish Neoplatonic Circle*, p. 48.

268 New York, JTS, Mic. 8117, ff. 117v–118v [IMHM F 11308]; cf. Leicht, *Astrologumena Judaica*, p. 232.

269 London, British Library, Or. 9861, f. 40r–v [IMHM F 6632]; Munich, Bayerische Staatsbibliothek, cod. Heb. 214, f. 138r–v [IMHM F 1626]; cf. Leicht, *Astrologumena Judaica*, p. 323–5.

270 Munich, Bayerische Staatsbibliothek, cod. Heb. 214, ff. 138v–140v [IMHM F 1626]; cf. Martin Plessner, "Verwendung alttestamentlicher Psalmen zu astrologischen Zwecken im spanisch-jüdischen Mittelalter," *Orientalistische Literaturzeitung* 29 (1926): 788–91; Wolfgang Hübner, "Der Tierkreis in der Psalmenmagie," pp. 293–319 in E. Zenger, ed., *Ritual und Poesie: Formen und Orte Religiöser Dichtung im Alten Orient, im Judentum und im Christentum* (Freiburg: Herder, 2003), on pp. 295–7.

271 Cf. Leicht, *Astrologumena Judaica*, pp. 327–31.

272 Cf. Moshe Idel, *Golem* (Jerusalem: Schocken, 1996), pp. 258–70 (in Hebrew), who used three manuscripts: Budapest, Magyar Tudományos Akadémia, Kaufmann A 246, f. 1r–v [IMHM Fiche 97]; London, Montefiore Library, 431 (H. No. 188), ff. 7v–8r [IMHM F 8756]; and Munich, Bayerische Staatsbibliothek, cod. Heb. 214, f. 33r–v [IMHM F 1626]; cf. also Leicht, *Astrologumena Judaica*, pp. 327–9.

273 Cambridge, UL, Add. 1741.2 (SCR 842), ff. 97v–99r [IMHM F 17496]; Munich, Bayerische Staatsbibliothek, cod. Heb. 214, ff. 145r–148v [IMHM F 1626]; Oxford, Bodleian Library, Mich. 285 (Neubauer 2305), ff. 9r–11v [IMHM F 20997]; cf. Leicht, *Astrologumena Judaica*, pp. 329–31.

274 London, British Library, Or. 10,329 (Gaster 728), ff. 17r–19r [IMHM F 7691]; Manchester, John Rylands UL, Gaster 177, ff. 36r–39r [IMHM F 32332]; Sassoon 290 (now Serge Amar 145), pp. 107–14 [IMHM F 39891]. The text was published by Moses Gaster, "The Wisdom of the Chaldeans: An Old Hebrew Astrological Text," *Proceedings of the Society of Biblical Archeology* (1900): 329–51.

275 *Sefer ha-Levanah*, ed. A. W. Greenup (London, 1912).

276 London, British Library, Or. 6360 (Margoliouth 794), ff. 1v–6v [IMHM F 6531]; Gollancz, *Mafteaḥ Šelomoh*, ff. 25v–28v and 53r–54r; Amsterdam, Bibliotheca Rosenthaliana, 12 (Fuks 242), ff. 21v–24v and 40r–42r [IMHM F 11795].

277 Cf. Leicht, *Astrologumena Judaica*, pp. 342–57.

278 Cf. ibid., pp. 367–68 (Appendix I). I am currently preparing a critical edition of this text.

We may conclude that the Hebrew library of astral magic was probably never very extensive, despite the importance of the discipline for the development of Jewish thought in the later Middle Ages. Many of the titles mentioned by authors who read Arabic (like Maimonides) were probably never translated into Hebrew. Although we must reckon with the loss of manuscripts and texts, the secondary evidence from literary sources allows us to conclude that not many more Hebrew books on astral magic circulated in the Middle Ages than are known to us today.

The available evidence suggests that Hebrew literature on astral magic goes back to thirteenth-century Spain. During the fourteenth century, scholars in Provence contributed further translations. The bulk of the Hebrew literature on astral magic was produced from Latin sources, with the noticeable exceptions of the versions of the *Picatrix*, *Sefer ha-Tamar*, and *Sefer ha-ʿAṣamim*, although the Arabic *Vorlagen* of some of the Hebrew texts have not yet come to light. Original compositions in Hebrew – such as *Sefer ha-Kasdim* – are extremely rare. Later, there was renewed interest in the medieval literature on astral magic in Renaissance Italy, where Jewish scholars again occupied themselves with this branch of medieval thought and copied earlier texts. Yoḥanan Alemanno is the most prominent among these scholars,[279] but the fact that almost all the extant manuscripts with texts on astral magic come from Italy of the fifteenth to eighteenth centuries proves that other, anonymous, Jewish scholars must have done the same. Without their activities most of this literature would not have survived.

[279] On Alemanno see Moshe Idel, "The Study Program of R. Yoḥanan Alemanno," *Tarbiz* 48 (1979): 303–31.

15

Astrology in Medieval Jewish Thought (Twelfth–Fourteenth Centuries)

Shlomo Sela

The purpose of this chapter is to draw the main contours of what we may call the Hebrew astrological landscape. I briefly present the main figures and their works and point out the more general cultural tendencies within which they worked. My focus is on Jewish thought expressed in Hebrew between the twelfth and the fourteenth centuries and exclusively in the discipline of astrology, rather than the philosophical or other discussions of its implications.

In the medieval period, Jewish adherents of astrology often invoked the Bible in support of their beliefs. However, there is no explicit mention of astrology in the Bible, although a few verses do refer to diviners, soothsayers, and the effects of the stars while discussing propitiatory rituals and omens of several types.[1] Later, in the talmudic period, Jewish society accommodated Hellenistic astrology to some extent. The astrologer is known in talmudic sources as *astrologos* or *kalday* (i.e., Chaldean) and astrology as *ʾiṣṭagninut* or *ʾastrologiyyah* – all words with a Greek origin.[2] The discussions related to astrology in the Babylonian and Jerusalem Talmuds, which bear on the relationship among the stars, human fate, and religious belief, also depend on astrological doctrines of Greek or Babylonian origin.[3] From the transitional period between Classical Antiquity and the Middle Ages, we have two Hebrew texts in which astrological themes loom large – the *Baraita de-Šemuʾel* and the *Baraita de-Mazzalot* – both of which draw on Hellenistic astrology and use Greek terminology.[4] Significant astrological contents are also included in two Hebrew works by Shabbetai Donnolo (913–ca. 982): *Sefer Ḥaḵmoni* and *Sefer ha-Mazzalot.*[5]

[1] For discussions of astrology in the biblical period, see: See Ida Zatelli, "Astrology and the Worship of the Stars in the Bible," *Zeitschrift für die Alttestamentliche Wissenschaft* 103 (1991): 86–99; M. Albani, "Horoscopes in the Qumran Scrolls," in Peter W. Flint and James C. VanderKam, eds., *The Dead Sea Scrolls after Fifty Years* (Leiden: Brill, 1999), pp. 279–330; M. Bar-Ilan, "Astrology in Ancient Judaism," in J. Neusner, A. Avery-Peck, and W. S. Green, eds., *The Encyclopaedia of Judaism, V, Supplement Two* (Leiden: Brill, 2004), pp. 2031–3.

[2] See J Shabbat 39a; B Shabbat 156.

[3] For discussions of astrology in the talmudic period, see: J. Charlesworth, "Jewish Interest in Astrology during the Hellenistic and Roman Period," *Aufstieg und Niedergang der römischen Welt,* Part 2, Vol. 2 20 (Berlin, 1987), pp. 926–50, on pp. 931–2; A. Altmann, "Astrology," in *Encyclopedia Judaica* (Jerusalem, 1971–2), 3: 788–95, on pp. 789–90; Lester J. Ness, *Astrology and Judaism in Late Antiquity* (Oxford, OH: Miami University 1990), pp. 154–6; M. N. Sobel, *ʾIṣṭagninut, Encyclopedia Hebraica,* vol. 5 (Jerusalem, 1960), pp. 453–74, on pp. 466–8 (in Hebrew); Bar-Ilan, "Astrology in Ancient Judaism," pp. 2033–7.

[4] *Baraita de-Mazzalot* in *Oṣar Midrašim,* ed. J. D. Eisenstein (New York, 1928); *Baraita de-Šemuʾel ha-Qaṭan,* comm. Lev Lipkin (Piotrków, 1901); G. B. Sarfati, "Introduction to the *Baraita de-Mazzalot,*" *Bar Ilan* 3 (1965): 56–82 (in Hebrew).

[5] D. Casterlli, *Il Commento di Sabbetai Donnolo sul libro de la Creazione* (Florence, 1880); S. D. Luzzato, *Kerem Ḥemed* 7 (1843): 60–7. See also A. Sharf, *The Universe of Shabbetai Donnolo* (New York: Ktav Press, 1976).

In the early Islamic setting, after the middle of the eighth century, there were several important astrologers of Jewish origin who wrote in Arabic: Māshā'allāh (d. ca. 815), Sahl Ibn Bishr Ibn Habib al-Yahūdī (active in the early ninth century), Ali Ibn Dāwud al-Yahūdī (active at the end of the ninth century), and Dunash Ibn Tamim of Kairouan (fl. ca. 950).[6] However, these scholars worked as astrologers in the majority culture and did not include any references to Jewish culture in their works.

The twelfth century saw a growing Jewish interest in astrology, which must be situated in the framework of two concomitant cultural developments. On the more general level of broader cultural developments in Europe, the interest in astrology was one of several expressions of the accommodation of Greco-Arabic science; from the narrower perspective of Jewish cultural history, it was part of a process in which Jewish scholars gradually abandoned the Arabic language and adopted Hebrew as a vehicle for the expression of secular and scientific ideas. Greco-Arabic astrology was introduced into Western Europe as part of an integrated body of sciences that also included astronomy and mathematics. Yet the reception of the two bodies of knowledge – astrology and astronomy – differed. The theories and applications of astronomy, especially the calendric aspects of the rituals of the three monotheistic communities, provided it with a rationale that facilitated its smooth reception. However, astrology was problematic, inasmuch as it had significant implications for theology and philosophy. Because its theory and praxis were founded on a deterministic view of the relation between the upper and lower worlds, astrological doctrines were sometimes opposed because they were understood as implying a denial of human freedom and as undermining the basis of religion.

However, a more favorable reception greeted the earliest instances of Hebrew astrological literature in the Iberian peninsula at the beginning of the twelfth century: two astrological texts conserved in the commentary on *Sefer Yeṣirah,* composed by Judah ben Barzillai al-Bargeloni, the leading rabbinic authority in Barcelona in the first half of the twelfth century. The first text – a list of the planetary positions and their astrological implications at a certain time – is a fragment from a now lost Arabic-to-Hebrew translation of Saadia's commentary on *Sefer Yeṣirah* (*Tafsīr Kitāb al-Mabādi*).[7] The Hebrew astrological nomenclature of this fragment is quite different from the vocabulary created later by Abraham Bar Ḥiyya and Abraham Ibn Ezra; its importance is that it represents one of the first attempts (if not the first) to create a Hebrew terminology for describing horoscopes. Analysis of the second text conserved in Judah ben Barzillai's commentary on *Sefer Yeṣirah* – a cosmology and miscellany of astrological doctrines – reveals that Judah ben Barzillai based it on a lost Hebrew astrological text (which collected Hellenic and talmudic astrological traditions that were quite different from Arabic astrology); this lost text was the precursor of the modern editions of the *Baraita de-Šemu'el* and the *Baraita de-Mazzalot.*[8] An analysis of these two astrological texts, as well as of other scientific texts incorporated in this commentary on

[6] Ṣâʿid al-Andalusī, *Kitāb Tabaqāt al-'umam,* in *Science in the Medieval World,* "*Book of the Categories of Nations,*" by Ṣāʿid al-Andalusī, trans. and ed. by Semaʿan I. Salem and Alok Kumar (Austin, 1991), pp. 79–82; D. Pingree, "Māshā'llāh," *Dictionary of Scientific Biography* (New York, 1974), 9: 159–62; B. R. Goldstein, "Astronomy and the Jewish Community in Early Islam," *Aleph* 1 (2001): 17–57; Georges Vajda, *Le Commentaire sur le Livre de la Création de Dûnaš ben Tāmīm de Kairouan (Xe siècle),* rev. and expanded by Paul B. Fenton (Leuven: Peeters, 2002), pp. 62, 66–7, 106–7.

[7] *Peruš Sefer Yeṣirah me'et Yehudah b. Barzillai,* ed. S. J. Halberstam (Berlin: Mekize Nirdamim, 1885), p. 214; cf. Yosef Qafiḥ, ed., *Sefer Yeṣirah (Kitāb al-Mabādi)* (Jerusalem: Commission for the Publication of Rasag's Books, 1972), pp. 86–7. For an English translation of the first text, see Goldstein, "Astronomy and the Jewish Community," pp. 50–4.

[8] *Peruš Sefer Yeṣirah,* pp. 247–8; cf. *Baraita de-Šemu'el* VII; *Baraita de–Mazzalot* XII. S. Sela, "Dos textos astrológicos conservados en el comentario al *Sefer Yeṣiráh* de Yehudáh ben Barzilay al Bargeloni," *Sefarad* 68 (2008): 261–90.

Sefer Yeṣirah, reveals that Judah ben Barzillai adopted a conservative approach: Instead of finding inspiration in Arabic science, he demonstrated a clear preference for texts written by Jews and circulating in Jewish society.[9]

Judah ben Barzillai's connection to astrology is also evident in the fact that Abraham bar Ḥiyya (ca. 1065–ca. 1136) found it appropriate to send him his famous "Epistle on Astrology." Some scholars believe that Judah ben Barzillai was critical of Bar Ḥiyya, but there is nothing substantial in the text of the letter to support this view. In all likelihood, Bar Ḥiyya sent the epistle to Judah ben Barzillai because he was the local rabbinic authority and a convenient and receptive addressee to whom Bar Ḥiyya could voice his defense of astrology. Notice that one of the doctrines treated by Judah ben Barzillai in a quite neutral tone, in the second of the texts of his commentary on *Sefer Yeṣirah,* states that even-numbered hours are inauspicious and odd-numbered hours auspicious; this is precisely the astrological rule whose application for choosing the most appropriate time for a wedding triggered Bar Ḥiyya's apologetic epistle.[10]

Abraham Bar Ḥiyya was the first to undertake the creation of a corpus of Hebrew scientific texts. Although none of his scientific works refers to astrology in its title, some do have an important astrological component.[11] The fifth and longest chapter of *Megillat ha-megalleh* (Scroll of the Revealer) is an impressive astrological composition in its own right. It presents a Jewish and universal astrological history along with an astrological prognostication of the coming of the Messiah, mainly by means of an analysis of horoscopes cast at the vernal equinoxes of the years in which a conjunction of Saturn and Jupiter took place. In addition to its references to the well-known cycles of 20, 240, and 960 years, one of the peculiarities of *Megillat ha-megalleh* is its reference to a Saturn–Jupiter conjunction with a cycle of 2,859 years, of which no trace has been found elsewhere in the art of medieval Arabic, Latin, and Hebrew conjunctionalism. This cycle served as the chronological framework into which Bar Ḥiyya frames his complete astrological history: from "the rise of the kingdom of Israel" to the prospective coming of the Messiah in *anno mundi* 5228, which marks its end.[12]

Bar Ḥiyya also devotes the last three chapters of *Ḥeshbon mahalakot ha-kokavim* (Computation of the Motions of Stars) to discussions of astronomical, geometrical, and mathematical aspects of astrological doctrines, without, however, going into the interpretative aspects of the horoscope or of other astrological tenets.[13] Particularly interesting from a historical point of view is the aforementioned mentioned "Epistle on Astrology," which Bar Ḥiyya addressed to Judah ben Barzillai. Bar Ḥiyya's intention there was to offer a detailed halakhic defense of his version of astrology and to show that it is in perfect harmony with the main tenets of Judaism. Bar Ḥiyya is the first Jewish intellectual to dwell on the relationship among astronomy, astrology, and astrological magic, employing their intertwining characteristics to

9 Sela, "Dos textos astrológicos," pp. 275–90.

10 S. Sela, "Abraham Bar Ḥiyya's Astrological Work and Thought," *Jewish Studies Quarterly* 13 (2006): 128–58, on pp. 154–7.

11 On Bar Ḥiyya's astrological work, see ibid., pp. 131–40. See also S. Baron, *A Social and Religious History of the Jews,* vol. 8 (Philadelphia, 1958), pp. 182–4; José M. Millás Vallicrosa, "La obra enciclopédica de R. Abraham bar Ḥiyya," in *Estudios sobre historia de la ciencia española* (Madrid, 1987), pp. 219–62; C. Sirat, *A History of Jewish Philosophy in the Middle Ages* (Cambridge, 1990), pp. 93–104; Y. T. Langermann, *The Jews and the Sciences in the Middle Ages* (Aldershot, 1999), pp. 11–14; S. Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003), pp. 101–4.

12 Abraham Bar Ḥiyya, *Sefer Megillat ha-megalleh,* ed. A. Poznanski, introduction and notes by J. Guttmann (Berlin: Mekize Nirdamim, 1924), pp. 152–3.

13 These three astrological chapters actually constitute what is sometimes a word-for-word and sometimes a paraphrastic rendering into Hebrew of chapters xxxv, liii, liv, and lv of Al-Battānī's *Zīj al-Ṣābi.* For a printed edition, see *Séfer Ḥešbón mahlekot ha-kokabim,* ed. José M. Millás Vallicrosa (Barcelona: Consejo Superior de Investigaciones Científicas, 1959), pp. 103–17 (Hebrew section). Cf. Al-Battani sive Albatenni, *Opus Astronomicum, latine versum a Carolo Alphonso Nallino* ([Milan], 1903), pp. 73–4, 128–9, 129–31, 133–4.

define what he deemed to be a legitimate and permissible version of astrology. He demonstrates the closeness between astrology and astronomy and draws a sharp dividing line between his permissible version of astrology and astrological magic.[14] We also know that Bar Ḥiyya planned to write a technical astrological handbook, although there is no evidence that he ever did so.[15]

Important as the role of astrology may have been in Bar Ḥiyya's scientific work, it pales when compared to the prominent role that it played in Abraham Ibn Ezra's oeuvre, which deals with the main genres of Arabic astrology: introductions to astrology, nativities, continuous horoscopy, general astrology, interrogations, elections, and medical astrology. The catalogue of his astrological writings has recently been significantly expanded by some new discoveries: Renate Smithuis recently identified four astrological treatises in Latin as versions of lost Hebrew originals by Ibn Ezra.[16] Two Hebrew fragments[17] and one complete Hebrew text[18] have been identified as the Hebrew originals of three of these Latin texts. This brings the corpus of Ibn Ezra's known astrological writings to eighteen treatises:

- (1–3) *Rešit ḥokmah* (Beginning of Wisdom, two versions)[19] and *Mišpeṭei ha-mazzalot* (Book of the Judgments of the Zodiacal Signs), which are introductory textbooks of astrology;
- (4–5) *Sefer ha-Ṭeʿamim* (Book of Reasons, two versions), explaining the astrological reasons underlying the concepts employed in both versions of *Rešit ḥokmah;*
- (6–7) *Sefer ha-Moladot* (Book of Nativities, two versions),[20] on genethlialogical astrology;
- (8) *Sefer ha-Tequfah* (Book of the Revolution), on continuous horoscopy;
- (9–11) *Sefer ha-Mivḥarim* (Book of Elections, three versions), with instructions for choosing the most auspicious moment for accomplishing specific acts;
- (12–14) *Sefer ha-Šeʾelot* (Book of Interrogations, three versions), replying to questions addressed to the astrologer;
- (15–16) *Sefer ha-Meʾorot* (Book of Luminaries, two versions),[21] concerned mainly with medical astrology; and
- (17–18) *Sefer ha-ʿOlam* (Book of the World, two versions), on general astrology.

Ibn Ezra's astrological treatises became very popular, circulating widely in Hebrew, Latin, and vernacular languages, as attested by the large number of surviving manuscripts.[22]

[14] *Epistle Addressed to Rabbi Judah b. Barzillai of Barcelona*, ed. Z. Schwarz, pp. 24–35 in S. Kraus, ed., *Festschrift Adolf Schwarz* (Berlin, 1917); Sela, "Abraham Bar Ḥiyya's Astrological Work," pp. 140–52.

[15] See *Sefer Ṣurat ha-ʾAreṣ*, ed. S. Munster (Basilea, 1546), p. 6. This astrological textbook was intended to be the last part of a trilogy dealing with astronomy and astrology.

[16] R. Smithuis, "Abraham Ibn Ezra's Astrological Works in Hebrew and Latin: New Discoveries and Exhaustive Listing," *Aleph* 6 (2006): 254–72.

[17] These two fragments survive in a bifolium, reused in the seventeenth century to bind a notarial register, discovered by M. Perani in the Italian Geniza. S. Sela and R. Smithuis, "Two Hebrew Fragments from Unknown Redactions of Abraham Ibn Ezra's *Sefer ha-Mivḥarim* and *Sefer ha-Šeʾelot*," *Aleph* 9(2) (2009): 225–40.

[18] *Sefer ha-Tequfah,* which survives in four manuscripts. S. Sela, "*Sefer ha-Tequfah*: An Unknown Treatise on Anniversary Horoscopy by Abraham Ibn Ezra," *Aleph* 9(2) (2009): 241–54.

[19] Only a fragment of the second version survives. S. Sela, "A Fragment From an Unknown Redaction of *Rešit ḥokmah* by Abraham Ibn Ezra," *Aleph* 10(1) (2010): 43–66.

[20] The second version survives in a Latin translation entitled *Liber Nativitatum.* See Smithuis, "Abraham Ibn Ezra's Astrological Works," pp. 262–6.

[21] The existence of the second version of *Sefer ha-Meʾorot* emerges from the fact that two of the three quotations from *Sefer ha-Meʾorot* that Joseph ben Eliezer Bonfils (or Ṭov Elem) – a great connoisseur of Ibn Ezra's work – included in *Ṣafenat Paʿneaḥ* (a supercommentary on Ibn Ezra's commentary on the Pentateuch) do not match any part of the extant text of *Sefer ha-Meʾorot.* See Joseph Bonfils, *Sophnat Pane'ach,* Ein Beitrag sur Pentateuchexegese des Mittelalters von D. Herzog (Heidelberg: Carl Winters Universitätsbuchhandlung, 1911), II, pp. 13:19–22, 35:6–7, 36:10–12.

[22] On Ibn Ezra's astrological treatises, see: D. Rosin, "Die Religionsphilosophie Abraham Ibn Esra's," *Monatsschrift für Geschichte und Wissenschaft des Judentums* 42 (1898): 247–51; M. Steinschneider, "Abraham Ibn Esra (Abraham

In addition to providing Hebrew readers with access to astrology, Ibn Ezra incorporated a very significant astrological component into his biblical commentaries. From the point of view of Jewish intellectual history, this was a novel move. In Ibn Ezra's opinion, the astrologer's paraphernalia allowed one to decipher the meaning of the revelation transmitted by the biblical text. Whereas Ibn Ezra's scientific treatises were intended to serve as textbooks or reference books, summarizing established doctrines, his biblical commentaries expound his own views. Ibn Ezra does this in particular in several theological excursuses that convey his own astrological, philosophical, and scientific ideas. Thus, Ibn Ezra is important in two ways: His astrological works created a Hebrew corpus of astrological texts, and by incorporating astrological ideas into biblical exegesis and other Jewish texts, he promoted the smooth absorption of astrological content into the hard core of Jewish culture.

Ibn Ezra's astrological thought and oeuvre have been the subject of much scholarly work since the nineteenth century.[23] By contrast, only five of Ibn Ezra's astrological works have been issued in a critical edition and translated into a European language.[24] Other editions are not critical and as a rule are based on a single manuscript. A scientific edition of Ibn Ezra's complete astrological encyclopedia is therefore a priority.[25]

Recent research has shown that the impact of astrology, notably that of Ibn Ezra, was evident in the second half of the twelfth century in Provence, a region in which both he and Abraham Bar Ḥiyya were active. The study of a prognostication based on the conjunction of Saturn and Jupiter in 1166 has revealed that the anonymous author employed certain astrological terms specific to Abraham Ibn Ezra alongside others that were characteristic of Bar Ḥiyya.[26] A particularly important text is an epistle, dating from the closing years of the twelfth century, in which a group of people in southern France address to Maimonides a

Judaeus, Avenare)," *Gesammelte Schriften* (Berlin, 1925), pp. 407–98, on pp. 495–8 = *Supplement zur Zeitschrift für Mathematik und Physik* 25 (1880): 59–128; R. Levy, *The Astrological Works of Abraham Ibn Ezra* (Baltimore, 1927); Baron, *Social and Religious History*, vol. 8, pp. 175–9 and 364–9; Bernard R. Goldstein, "Astronomy and Astrology in the Works of Abraham Ibn Ezra," *Arabic Sciences and Philosophy* 6 (1996): 9–21; S. Sela, "Abraham Ibn Ezra's Scientific Corpus: Basic Constituents and General Characterization," *Arabic Sciences and Philosophy* 10 (2001): 91–149, on pp. 115–31; Sela, *Ibn Ezra and Hebrew Science*, pp. 57–74; Smithuis, "Abraham Ibn Ezra's Astrological Works," pp. 239–338.

[23] See, for example, M. Friedlander, *Essays on the Writings of Abraham Ibn Ezra* (London, 1877); Rosin, "Die Religionsphilosophie Abraham Ibn Esra's," pp. 17–33, 58–73, 108–15, 154–61, 200–14, 241–52, 305–15, 345–62, 394–407, 444–57, 481–505; 43 (1899): 22–31, 75–91, 125–33, 168–84, 231–40; H. Greive, *Studien zum jüdischen Neuplatonismus: Die Religionsphilosophie des Abraham Ibn Ezra* (Berlin, 1973); Y. T. Langermann, "Some Astrological Themes in the Thought of Abraham Ibn Ezra," in I. Twersky and J. M. Harris, eds., *Rabbi Abraham Ibn Ezra: Studies in the Writings of a Twelfth-Century Jewish Polymath* (Cambridge, MA: Harvard University Press, 1993), pp. 28–85; R. Jospe, "The Torah and Astrology in Abraham Ibn Ezra's Thought," *Da'at* 32–3 (1994): 31–52 (in Hebrew); D. Schwartz, *Astral Magic in Medieval Jewish Thought* (Ramat Gan, 1999), pp. 62–91 (in Hebrew); S. Sela, *Astrology and Biblical Exegesis in the Thought of Abraham Ibn Ezra* (Ramat Gan, 1999) (in Hebrew); idem, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science*; M. Gomez Aranda, *Sefarad científica, la visión judía de la ciencia en la edad media* (Madrid, 2003), pp. 39–77.

[24] Abraham Ibn Ezra, *The Book of the World: A Parallel Hebrew-English Critical Edition of the Two Versions of the Text*, ed., trans., and annot. Shlomo Sela (Leiden: Brill, 2010); Abraham Ibn Ezra, *The Book of Reasons: A Parallel Hebrew-English Critical Edition of the Two Versions of the Text*, ed., trans., and annot. Shlomo Sela (Leiden: Brill, 2007); Raphael Levy and Francisco Cantera, *The Beginning of Wisdom: An Astrological Treatise by Abraham Ibn Ezra* (Baltimore: Johns Hopkins University Press, 1939). With regard to the latter, not only is the translation unsatisfactory but the authors also acknowledge that their goals were unrelated to the history of astrology (p. 15). See also Levy, *The Astrological Works*, p. 65.

[25] I have begun work on annotated critical editions and translations of these texts.

[26] B. R. Goldstein: "A Prognostication Based on the Conjunction of Saturn and Jupiter in 1166 [561 A.H.]," in C. Burnett et al., eds., *Studies in the History of the Exact Sciences in Honour of David Pingree* (Leiden: Brill, 2004), pp. 735–53.

series of queries on astrological themes.[27] Maimonides' famous "Letter on Astrology" was written in response to this epistle. The letter writers refer to "the scholars of our country, who have already followed the path of this science (i.e. astrology)," thus indicating that astrology had become a widespread discipline. I have recently shown that the authors incorporate in their queries verbatim quotations and paraphrases of passages from several astrological treatises by Abraham Ibn Ezra. The queries thus show the bewilderment that Ibn Ezra's astrological treatises, as well as other Jewish astrological sources, had caused.[28]

Maimonides' "Letter on Astrology" was a blistering attack on astrology. Because of Maimonides' towering stature, his stance toward astrology was of great importance, although by no means sufficient to bar astrology from Jewish cultures, as we shall see. Maimonides' stance must not be misconstrued as a forerunner of the modern rejection of astrology. For example, Gad Freudenthal has shown that, like all philosophers in the Arabic tradition, Maimonides shared many of the premises in natural philosophy on which astrologers claimed to base their discipline, including the widely accepted medieval theories about the physical influences of the heavenly bodies on the sublunar realm, as well as ideas derived from biology, medicine, and climatology. According to Freudenthal, Maimonides' rejection of astrology must not be interpreted as an "esoteric" move that hides his true beliefs. Rather, it was sincere and was motivated mainly by considerations related to the religious and social consequences of astrology. Like most of his contemporaries, he did not take it seriously as a scientific theory and did not deem it worthy of refutation.[29] In a parallel study, Y. Tzvi Langermann has explored the connection between Maimonides' scientific outlook and his rejection of astrology as a false science; he has also studied the connection in Maimonides' thought among astrology, star worship, and the denial of free will.[30]

Further research on Maimonides' attitude to astrology seems to be needed. For one thing, Maimonides' "Letter on Astrology," although edited and translated many times, has not been studied in detail and in depth. Moreover, H. A. Davidson has recently argued that Maimonides did not write the entire text.[31] What implications would acceptance of this thesis have for our view of Maimonides' opposition to astrology? There are also questions that have hardly been touched on by modern research: With what astrological sources was Maimonides acquainted? Was his opposition to astrology a reaction to contemporaneous developments in Jewish society? Another set of questions relates to the impact of Maimonides' position. The study of documents from the Cairo Geniza has shown that Jews in twelfth-century Fustat held astrology in high esteem and that the casting of horoscopes was common.[32]

[27] First published in A. Marx, "The Correspondence between the Rabbis of Southern France and Maimonides about Astrology," *Hebrew Union College Annual* 3 (1926): 312–58. For a new edition with English translation and detailed analysis, see S. Sela, "Queries on Astrology Sent from Southern France to Maimonides: Critical Edition of the Hebrew Text, Translation, and Commentary," *Aleph* 4 (2004): 89–190.

[28] Sela, "Queries on Astrology."

[29] G. Freudenthal, "Maimonides' Stance on Astrology in Context: Cosmology, Physics, Medicine, and Providence," in F. Rosner and S. Kottek, eds., *Moses Maimonides, Physician, Scientist, and Philosopher* (Northvale, NJ: Jason Aronson, 1993), pp. 77–90.

[30] Y. T. Langermann, "Maimonides' Repudiation of Astrology," *Maimonidean Studies* 2 (1991): 123–58. For other studies of Maimonides' view of astrology, see J. Kreisel, "Maimonides' Opinion of Astrology," *Proceedings of the Eleventh World Congress of Jewish Studies*, Vol. 2, Part 3 (Jerusalem, 1994): 25–32 (in Hebrew); Schwartz, *Astral Magic*, pp. 92–110; S. Sela, "The Fuzzy Borders between Astronomy and Astrology as Reflected in the Thought and Work of Three Twelfth-Century Jewish Intellectuals," *Aleph* 1 (2001): 59–100.

[31] H. A. Davidson, *Moses Maimonides, the Man and His Works* (Oxford: Oxford University Press, 2005), pp. 494–501.

[32] S. D. Goitein, *A Mediterranean Society* (Berkeley: University of California Press, 1988), 5: 420–2; B. R. Goldstein and D. Pingree, "Horoscopes from the Cairo Geniza," *Journal of Near Eastern Studies* 36 (1977): 113–44; idem, "More Horoscopes from the Cairo Geniza," *Proceedings of the American Philosophical Society* 125 (1981): 155–89;

Why was Maimonides unable to stem the rise of astrology? For one thing, he emphasized that astrology is strongly associated with star worship and implies the denial of free will. Yet Jewish supporters of astrology, such as Ibn Ezra and Bar Ḥiyya, made every effort to dissociate it from astrolatry and astrological magic, which they themselves criticized as undermining the Jewish religion.[33] They also distanced themselves from any extreme fatalistic version of astrology and kept reiterating that deliverance from the decrees of the stars is not only possible but also a desirable and necessary step for anyone who wishes to perfect his or her religious belief.[34] Thus a key reason for Maimonides' failure to eradicate astrology may be that he addressed his criticism to the wrong target: His opposition to astrology may well have struck contemporary proponents as missing its target and beside the point. This hypothesis calls for further research.

In fact, the "Letter on Astrology" notwithstanding, in the generations following Maimonides, there was a remarkable expansion of scholarly astrology. This widespread cultural phenomenon and its various facets have attracted little attention from modern research. As described earlier, the main vehicles for the diffusion of astrological ideas within Jewish society were the twelfth-century Hebrew astrological treatises by Abraham Ibn Ezra and, to a lesser extent, by Abraham Bar Ḥiyya, which were often copied. These texts were not transmitted as isolated items, but as components of astrological compilations or collections, presumably reflecting the specific preferences of the scribe or of the person who requested the services of the scribe. We know that such texts circulated in Provence as early as the final decades of the twelfth century.[35]

However, in the fourteenth century, the number of extant manuscripts of this sort increased substantially.[36] In some cases, Jewish scholars and scribes went beyond mere copying. In the MS héb. 1058 of the Bibliothèque nationale de France (BNF), for example, an anonymous mid-thirteenth-century scribe assumed the role of editor and compiled a vast astrological and astronomical anthology of thirty-four chapters (of which only the last four are extant) – usually without naming his sources and adding notes and comments to present his own opinions about the contents of the incorporated texts. An examination reveals that he drew mainly on the astrological works written in the previous century by Ibn Ezra and Bar Ḥiyya.[37]

idem, "Astrological Almanacs from the Cairo Geniza," *Journal of Near Eastern Studies* 38 (1979):153–75, 231–56; idem, "Additional Astrological Almanacs from the Cairo Geniza," *Journal of Near Eastern Studies* 103 (1983): 673–90.

33 Thus Bar Ḥiyya condemns astral magic and compares it with four sects in an account that is very similar to Maimonides' later description of the Sabians (*Epistle to Judah b. Barzilai*, pp. 31–3). See also Sela, "Abraham Bar Ḥiyya's Astrological Work," pp. 23–5. A similar stance is noticeable in Ibn Ezra's oeuvre; see Ibn Ezra, *Book of Reasons* (second version), §8.3:2 (pp. 250–1). See also his comments on the following biblical passages: Gen. 31:19; Ex. 20:2, 3, 5; 20:14; 23:25 (long commentary); Ex. 20:2; 32:1 (short commentary); Lev. 19:4, 31; Num. 21:8.

34 See, e.g., *Epistle to Judah b. Barzilai*, pp. 23–6; Ibn Ezra, long commentary on Ex. 33:21, in *Ibn Ezra's Commentary on the Torah*, ed. A. Weiser (Jerusalem, 1976), 2, 218.

35 Sela, "Queries on Astrology," pp. 74–82; MS Paris, BNF héb. 1058, ff. 50–133.

36 See, e.g., BNF héb. 1055 [F 14658], ff. 1–52 (dated 1314); BNF héb. 1044 [F 33995], ff. 132–249, 196–201; BNF héb. 1045 [F 33996], ff. 89–177, 196–201; BNF héb. 1058 [F 14642], ff. 1–39; Bodleian Library Mich. 39 [F 19308], ff. 1–83 (from a MS copied in 1330); Bodleian Library Opp. 707 [F 19310], ff. 1–155 (dated 1410).

37 See BNF héb. 1058 [F 14642], ff. 50–133. Chapter 33, for example, was devoted to general astrology and included the following texts: the complete universal astrological history from chapter 5 of Bar Ḥiyya's *Megillat ha-Megalleh* (ff. 64a–86a), a comment added by the scribe to solve the combinatorial problem of the 120 conjunctions of the seven planets (ff. 86a–87a), the last five chapters of the Hebrew translation of Māshā'allāh's *Book on Eclipses* (ff. 87a–88b), and the complete second version of Ibn Ezra's *Sefer ha-ʿOlam* (ff. 88b–93b). See also G. Vajda, "Une compilation astrologique faussement attribuée à Abraham Bar Ḥiyya," *Sefarad* 20 (1960): 159–62.

A vibrant stream of translations into Hebrew of astrological texts, mainly from Arabic but in some cases from Latin, gathered momentum in the thirteenth and particularly in the fourteenth century, as part of the larger movement of translations into Hebrew of astronomical, mathematical, philosophical, and medical texts. In due course, medieval Jewish scholars naturally became eager to complement their reading of the available Hebrew astrological texts with additional sources that they knew to be available in Greek and Arabic. This led to additional translations of astrological literature, which amateurs of astrology combined with the earlier literature to form new and more comprehensive anthologies. A typical example in this regard is BNF MS héb. 1055, dated to the first half of the fourteenth century, which contains a selection of Ibn Ezra's astrological works together with six translations of astrological texts from Arabic into Hebrew, three of them by Qalonymos ben Qalonymos (1314).[38]

We should also consider the astrological sections in some medieval Hebrew encyclopedias of the sciences. The earliest is the astrological section of *Midraš ha-Ḥoḵmah*, composed by Judah ben Solomon ha-Cohen Ibn Matqah of Toledo in the first half of the thirteenth century. Originally in Arabic, it was translated into Hebrew by the author himself, using an idiosyncratic terminology that depends neither on Ibn Ezra nor on Bar Ḥiyya. Judah differs from his predecessors in that he does not draw on Arabic astrology, but concentrates instead on a critical synopsis of the four parts of Ptolemy's *Tetrabiblos*.[39] Another encyclopedia that included astrological material is Levi ben Abraham ben Ḥayyim's (1235–1305) *Liwyat Ḥen*, written after 1276, in which chapter forty of the third book is an astrological treatise indebted to Ibn Ezra and Bar Ḥiyya.[40] This work has not yet been studied in depth.

Another literary genre that bears witness to the influence of astrology but has been only sporadically touched on by modern research is medieval rabbinical literature. The main point to be emphasized here is that many of the great rabbis, such as Abraham ben David of Posquières (ca. 1125–98) in his *Haśśagot*, Naḥmanides (1194–1270) in his biblical commentaries, and Solomon ben Abraham Adret (ca. 1235–ca. 1310) in his *Responsa*, dealt with astrology and were generally favorably disposed toward it.[41]

In the work of Gersonides, in the first half of the fourteenth century, we witness not only a favorable attitude toward astrology but also a multidisciplinary approach reminiscent of that

38 BNF héb 1055 [F 14658]. These translations are (a) ספר הפרי הנקרא מאה דבורים (Book of the Fruit Called [Also] the Hundred Statements), on ff. 67a–52b, which is a translation of Pseudo-Ptolemy's *Centiloquium* (including the commentary by Abu Jaʿafar), rendered from the Arabic by Qalonymos ben Qalonymos in 1314; (b) שאלות למשאללה (Māshā'allāh's interrogations), on ff. 38b–40a; (c) ספר למשאללה בקדרות הלבנה והשמש ותקופת השנים (Māshāʾallāh's Book on Eclipses of the Moon and the Sun and the *tequfot* of Years), on ff. 40a–41b – a translation that certainly dates before the middle of the thirteenth century, because a fragment of it is included in the astrological anthology mentioned in the previous note (BNF héb. 1058); the attribution to Ibn Ezra is likely to be erroneous; (d) אגרת בקצור המאמר במולדות (Summary of the Treatise on Nativities), on ff. 68b–70b, by Yaʿqub al-Kindī, translated by Qalonymos ben Qalonymos in 1314; (e) אגרת בעלות המיוחסות אל האישים העליונים המורות על הוית הגשמים (Letter on the Causes Attributed to the Higher Bodies Which Indicate the Origin of Rain), on ff. 70b–74a, translated by Qalonymos ben Qalonymos; (f) אגרת בלחויות ובמטר הנקראת האגרת המספקת (Letter on Moistures and Rain, Entitled the "Sufficient One"), on ff. 74b–81b, translated from Arabic by Qalonymos ben Qalonymos.

39 This work was published with the title *Mišpeṭei ha-koḵavim* (The Decrees of the Stars) (Warsaw, 1886). It has also been briefly commented on: M. Steinschneider, "The Hebrew Translations of the Middle Ages (an annotated translation by Ch. Manekin)," in *The Medieval Hebrew Encyclopedias*, ed. S. Harvey (Dordrecht: Kluwer Academic Publishers, 2000), pp. 468–519, on pp. 474–5; Marx, "The Correspondence," pp. 314–15; Y. T. Langermann, "Some Remarks on Judah ben Solomon ha-Cohen and His Encyclopedia, *Midrash ha-Hokhma*," in *The Medieval Hebrew Encyclopedias*, pp. 371–89, on pp. 379–80.

40 G. Freudenthal, "Sur la partie astronomique du *Liwyat Ḥen* de Lévi ben Abraham ben Ḥayyim," *Revue des études juives* 148 (1989): 103–12; W. Z. Harvey, "Levi ben Abraham of Villefranche's Controversial Encyclopedia," in *The Medieval Hebrew Encyclopedias of Science and Philosophy*, pp. 171–88, on pp. 187–8.

41 Altmann, "Astrology," p. 793; Sobel, *ʾIṣṭagninut*, p. 472.

taken by Ibn Ezra. Nonetheless, there are substantial differences between them. Gersonides wrote only one technical astrological work: a prognostication for the conjunction of Saturn and Jupiter of 1345.[42] In contrast, astrological themes, notably the anthropocentric view that the celestial bodies were purposefully created so as to emanate influences that perfect the sublunar world, are a cornerstone of his philosophy and theology, as expounded in his great philosophical work *The Wars of the Lord*.[43] Like Ibn Ezra, Gersonides incorporated astrology into his biblical commentaries, although to a much lesser extent.[44] The study of this aspect of Gersonides' thought is an important desideratum.

Another development that needs to be mentioned, albeit briefly (see Chapter 16), is the rise of astral magic in the late thirteenth century. Astral magic shares some of the tenets of astrology, but is far from being identical with it. Still, the two disciplines are historically connected: Drawing inspiration from the exegetical and astrological work of Abraham Ibn Ezra, astral magic emerged as a powerful intellectual movement in the fourteenth century, when it was viewed both as an efficient tool for harnessing the forces emanating from the stars and as providing a new interpretation of the authoritative Jewish texts and Jewish theology.[45]

Maimonides' campaign against astrology was not a total failure, however. In his vast encyclopedia, *Deʿot ha-pilosofim*, composed in the last quarter of the thirteenth century, Joseph Ibn Falaquera, a steadfast Maimonidean, ignored astrology altogether. The same is true of the somewhat later *Šaʿar ha-šamayim,* by Gershom ben Shlomo. Following in the footsteps of Maimonides, certain thinkers composed refutations of astrology. This is notably the case of Isaac ben Joseph Polgar, who, drawing on some of Maimonides' ideas, attacked astrology in his fourteenth-century *ʿEzer ha-dat*.[46] As Dov Schwartz has recently suggested, it is also possible that astral magic was latent already in the twelfth century and that Maimonides' influence delayed its rise until the end of the thirteenth century.[47]

In conclusion, astrology played an important role in medieval Jewish intellectual history. Central figures like Abraham Bar Ḥiyya, Abraham Ibn Ezra, Naḥmanides, Levi ben Abraham ben Ḥayyim, Gersonides, and many more drew on it or contributed to it. It was certainly practiced by many lesser luminaries, who were consulted by the anxiety-ridden rank and file and employed intensively by physicians.

[42] B. R. Goldstein and D. Pingree, *Levi ben Gerson's Prognostication for the Conjunction of 1345* (Philadelphia: American Philosophical Society, 1990). One of the findings of this study is that Gersonides drew on the macro-astrological work of his Hebrew predecessors, notably Ibn Ezra but also Bar Ḥiyya.

[43] See G. Freudenthal, "Levi ben Gershom as a Scientist: Physics, Astrology and Eschatology," *Proceedings of the Tenth World Congress of Jewish Studies*, Division C, Vol. 1: Jewish Thought and Literature (Jerusalem: World Union of Jewish Studies, 1990), pp. 65–72; repr. in idem, *Science in the Medieval Hebrew and Arabic Traditions* (Aldershot: Ashgate, 2005), Essay VI. One of Freudenthal's main aims was to show that in his astrology Gersonides drew on the best available science and on universally accepted medieval scientific doctrines. Y. T. Langermann ("Gersonides on Astrology," in Levi Ben Gershom, *The Wars of the Lord*, translated with notes by Seymour Feldman [New York and Jerusalem, 1999], 3: 506–19) argues that Gersonides was impressed by the explanatory power of astrology in accounting for the teleological features of heavenly phenomena.

[44] But see the different views on the history of Israel that Gersonides expressed in his commentary on the Book of Daniel and in his Prognostication, as noted by Freudenthal, "Levi ben Gershom," pp. 71–2.

[45] Schwartz, *Astral Magic*, pp. 145–199 et passim.

[46] Isaac Polgar, *ʿEzer ha-dat, A Defence of Judaism*, ed. and annot. Jacob Levinger (Tel Aviv, 1984), pp. 105–53 (in Hebrew).

[47] Schwartz, *Astral Magic*, pp. 125–8.

16

Astral Magic and Specific Properties (*Segullot*) in Medieval Jewish Thought

Non-Aristotelian Science and Theology

Dov Schwartz

Two basic paradigms dominated medieval science. The Aristotelian tradition sought to explain the behavior of substances in the sublunar world solely on the basis of their four elementary qualities (hot, cold, dry, and wet) and the theory of natural places. As Aristotle saw it, there was only one external influence on the material world that was necessary to explain the changes that took place within it: It derived from the sun's changing position with respect to the earth as a result of its motion in its annual orbit. Generation after generation of Aristotelian philosophers subscribed to this framework of scientific ideas.

However, Aristotelian tradition was opposed by other traditions that posited the reality of various kinds of natural powers, such as the influences of the stars on matter and human beings, various magical powers, and the like. These non-Aristotelian traditions concentrated their attention on phenomena (both real and imagined) that could not be attributed to the qualities of matter; in that sense they were supernatural. There was little or no communication between these traditions and the Aristotelian, for the Aristotelians denied the very reality of the powers that were at the core of the non-Aristotelian explanatory schemes.

Still, the astrological and magical traditions succeeded in embarrassing the Aristotelians because they could point to a cluster of phenomena whose reality could be neither denied nor explained in Aristotelian terms. These were the "specific qualities" (Hebrew *segullot*), that is, powers of certain substances that could not be explained by the substances' elementary qualities alone. The doctrine of *segullot* relies on the idea that some substances have certain hidden forms, in addition to their form as species (*forma specifica*), and that these potentialities are revealed only through experience. The Aristotelians could not ignore these phenomena, whose reality was posited above all in pharmacology, which established the powers of minerals and medicinal herbs. The opponents of the Aristotelian paradigm urged that the efficiency of *segullot* could be explained only by postulating specific powers and influences emanating from the superlunary world.

Many natural philosophers in the Hellenistic and Arab worlds took an intermediary position. Although globally Aristotelian, this position incorporated Neoplatonic elements and recognized certain phenomena that lay beyond the boundaries of the Aristotelian system; it attributed them to "supernal influences," mainly those of the stars. This was the position, for example, of al-Kindi and of the so-called Brethren of Purity (*Ikhwān al-Safā*ʾ). However, "purist" Aristotelians balked at combining the two paradigms. Because they had to admit the reality of "specific qualities," they recognized that not all phenomena could be derived from the qualities of an object and that there were numerous essences and possibilities in nature that could be not explained by the scientific and deductive methods of Aristotelian science. Put differently, some of the possibilities inherent in the forms of matter could be revealed by experience but not deduced from matter's basic qualities. Magnetism was the paradigmatic example: It was a specific property that could be witnessed empirically but could not be inferred from natural laws (i.e., from the qualities of matter); hence its causes were unknown.[1] These very different traditions both appealed to "experience": Proponents of astrology and astral magic drew on it to buttress their claims, but in medicine, too, the notion of "experience" played a major role, which was recognized even by those who denied the reality of magic.[2] In the subsequent discussion, I try to determine the theological status in medieval Jewish thought of two phenomena that clearly belong to the non-Aristotelian paradigm: astral magic and *segullot.*

ASTRAL MAGIC: A BRIEF CHARACTERIZATION

The practice of astral magic, popular among Jewish intellectuals from the early twelfth century on, was based on the idea that human beings can harness the powers of the celestial bodies for their own use and benefit. The stars and the constellations emanate a constant stream of "spiritual" influences (*ruḥaniyyāt* in the original Arabic), which are a source of powerful forces. The nature of these powers depends on the heavenly bodies from which they emanate and on their positions. The emanations and the powers can be purposefully directed in the terrestrial world, subject to the proper preparation or disposition of the receiving body (Heb. *hakanah*). This capture of heavenly emanations or supernal forces is referred to as "bringing (or drawing) down" (Heb. *horadah*). The practitioner of astral magic or magician brings down the "spiritualities" for practical purposes (e.g., to modify nature, foretell the future, or heal the sick). This cannot be done without a detailed and accurate knowledge of the positions of the heavenly bodies (planets, constellations) from which the powers emanate and of the necessary disposition of the receiving substances. To "draw down" the "spiritualities," the practitioner uses some image, effigy, or talisman symbolizing the emanating source – that is, the star or constellation – at a certain well-defined time. This procedure is based on the concept of sympathy and interaction between heaven and earth, between the symbol and what it symbolizes. In many cases the form of the emanating star or constellation is actually drawn or engraved on the image.

There are four stages in the magician's actions:

1. First comes a careful examination of the configuration of the stars and the constellations that can yield the desired result. For example, if the goal is to heal an invalid, the magician must determine which configuration of the stars guarantees the proper emanation for healing that particular sickness. It may be a given constellation on the horizon, the position of a certain planet (*mešaret*, servant) within the constellation (referred to in this context as a *bayit*, house), or the conjunction (Heb. *maḥberet*) of two planets within that constellation. In many cases, the configuration in question is elementary, involving a single constellation or star.
2. The magician prepares an image or effigy symbolizing the emanating configuration.

[1] See L. Thorndike, *A History of Magic and Experimental Science*, Vol. 2 (New York: Macmillan 1923), p. 769 and index, s.v. "Magnet"; A. C. Crombie*, Medieval and Early Modern Science* (New York: Doubleday, 1959), 1: 120–2; S. Pines, *Studies in Islamic Atomism* (Jerusalem: Magnes Press, 1977), pp. 162–4; Y. T. Langermann, "Gersonides on the Magnet and the Heat of the Sun," in G. Freudenthal, ed., *Studies on Gersonides* (Leiden: Brill, 1992), pp. 273–4.

[2] According to William Eamon, the term "experiment" had a variety of meanings, among which are the following: "Finally, 'experiments' included a large and heterogeneous body of magical recipes and methods for manipulating occult forces and qualities" (W. Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* [Princeton, NJ: Princeton University Press, 1994], p. 56).

3. The magician produces the effigy at the time the stars and constellations actually form the required configuration and applies it in a specific way. In the example of healing an invalid, the magician might place the effigy on the diseased part of the body at the time the star or constellation is active.
4. Various secondary techniques may be necessary, such as burning incense, offering prayers to the stars, chanting invocations, and using magical names.

The sources of astral magic are manifold; in this chapter I give only a few summary indications. Astral magic and the doctrine of *segullot* are clearly enunciated in the Hermetic writings (first to third centuries C.E.), whose philosophical worldview is a mixture of Neoplatonic, Stoic, and Eastern elements, alongside astrological concepts and detailed astral-magical techniques. These writings purported to reveal the secrets of the god Hermes, who was identified with the Egyptian god of wisdom, Thoth. For the Greco-Roman world, the ancient Egyptian religion, which was still practiced in Egypt, was a kind of "ancient wisdom" and therefore of great importance. The earliest systematic articulations of astral magic thus date from the waning years of the mythological idolatry of the Ancient East and the Hellenistic world. The Hermetic worldview – a major factor in the development of philosophical alternatives to the Aristotelian picture of the world – explained physical processes as in some degree caused by stellar influences on the material world, an assumption that grounded the astral-magical activity. That activity was also intended to help achieve the theoretical and ecstatic goals envisaged by the Hermetic writings. Despite the disapproval of official church circles, Hermetic writings and magical techniques enjoyed great popularity in Late Antiquity. Their magical and theurgical conceptions were reinforced by their affirmation within Neoplatonic philosophy, namely in the writings of Proclus and Iamblichus.

Hermetic ideas became particularly influential in Harran, Mesopotamia, in the ninth and tenth centuries, among the so-called Sabians. Believing that the source of all wisdom and science was Idris, identified with the ancient Enoch (or Hermes Trismegistus), they appropriated the elements of the original Hellenistic legacy: They adopted Neoplatonic, Neopythagorean, and Hermetic concepts and also elaborated a broad range of astral-magical techniques of their own, thereby making a major contribution to the development of Hermetic concepts in Arabic culture. Hermetic influence may be detected in the writings of al-Kindi (the letter *De radiis*),[3] the Brethren of Purity,[4] al-Biruni,[5] and other circles.[6] These philosophers all continued to favor an alternative to the purely scientific Aristotelian worldview and held that the order of the sublunar world depended on the supernal world. The doctrine of *segullot* was a necessary presupposition of astral magic.

Some medieval natural philosophers tried to come to terms with *segullot.* For example, Avicenna argued that the action of a *segullah* can be explained as deriving from a form superimposed on the *forma specifica* of a substance, that is, on its temperament.[7] This explanation integrated the doctrine of *segullot* into the province of natural philosophy, implying that it

[3] M. T. d'Alverny and F. Hudry, "Al-Kindi – *De radiis*," *Archives d'histoire doctrinale et littéraire du Moyen Age* 42 (1974): 139–260.

[4] Y. Marquet, "Sabéens et Ihwan Al-Safa," *Studia Islamica* 24 (1966): 35–80; 25 (1966): 77–109.

[5] S. H. Nasr, *An Introduction to Islamic Cosmological Doctrines* (Cambridge, MA: Harvard University Press, 1964), pp. 151ff.

[6] C. Burnett, "Arabic, Greek and Latin Works on Astrological Magic Attributed to Aristotle," in J. Kraye et al., eds., *Pseudo-Aristotle in the Middle Ages* (London: Warburg Institute, 1986), pp. 84–96. For magical techniques in astral-magical practice, see Y. Zoran, "Magic, Theurgy and the Knowledge of Letters in Islam and their Parallels in Jewish Literature" (Heb.), *Jerusalem Studies in Jewish Folklore* 18 (1997): 19–62.

[7] See R. Glasner, *A Fourteenth-Century Scientific Philosophical Controversy: Jedaiah Ha-Penini's "Treatise on Opposite Motions" and "Book of Confutation"* (Heb.) (Jerusalem: World Union of Jewish Studies, 1998), pp. 75–9. Glasner shows that Gersonides' view is similar to Avicenna's, whereas Jedaiah is closer to Averroes.

was not comparable to magic. Nevertheless, many late medieval thinkers clearly associated *segullot* with the doctrine of miracles and with various concepts of sorcery.[8]

THE INTRODUCTION OF ASTRAL MAGIC INTO JUDAISM

As in other areas, Muslim thought influenced medieval Jewish thought on astral magic and *segullot.* Once integrated into medical practice, its role therein helped astral magic infiltrate Jewish thought, and ultimately it exerted a major influence on systematic Jewish theology, beginning in the twelfth century. As we will see in this chapter, many thinkers argued that Judaism possessed a particularly great ability to attract stellar emanations, above that usually offered by astral magic. In fact, some thinkers explained almost all the commandments of the Torah as instruments for capturing stellar influence.[9] The introduction of astral magic into Jewish thought was facilitated by the fact that even staunch Aristotelians like Maimonides recognized the existence of celestial influences on sublunar phenomena.[10]

Clear astral-magical convictions were first expressed in the twelfth century by three poet-thinkers who were in personal contact: Moses Ibn Ezra (1055?–before 1135), Judah Halevi (1075?–1140), and Abraham Ibn Ezra (1089–1164); astral magic was in fact a distinct theological element in the writings of the last two thinkers. Yet the appropriation of these ideas was far from smooth. Their older contemporary Abraham Bar Ḥiyya (d. 1136) and their younger contemporary Maimonides (1138–1204) regarded the fashioning of effigies and the attraction of spirituality as idolatry; Maimonides even launched a frontal attack on all branches of astrology. This early stage of development of astral-magical thinking may be described as follows.

Judah Halevi, in *Sefer ha-Kuzari* (I, 97), describes the golden calf as a means of bringing down the "spirituality" of the stars: Fearful about their survival in the wilderness after Moses' disappearance, the Israelites fashioned the golden calf as a talisman to attract stellar emanations. According to Halevi, the Israelites' sin was that they devised the talisman themselves and did not wait for God to supply one, as He did later by furnishing the cherubim. In other words, the cherubim were a legitimate magical-astral device provided by God Himself, in contrast to the golden calf, which was of human manufacture. According to *Sefer ha-Kuzari*, the system of the commandments is an effective way, at least in part, to derive benefit from stellar influences. The Hermetic writings are mentioned respectfully in the book (I, 1); it is therefore clear that Halevi had incorporated their outlook into Jewish theology. As the first

[8] In the Renaissance, *segullot* were commonly associated with sorcery. See in this regard D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella* (Notre Dame: University of Notre Dame Press, 1975), pp. 12–13. The association with sorcery appears in various medieval Jewish sources. See, e.g., N. Arieli, "The Philosophy of Rashbaz: Shimon ben Zemach Duran" (Heb.), Ph.D. dissertation, Hebrew University of Jerusalem, 1976, p. 92.

[9] For astral magic as a theological factor see: M. Idel, "Hermeticism and Judaism," in I. Merkel and A. G. Debus, eds., *Hermeticism and the Renaissance* (London: Folger Shakespeare Library, 1988), pp. 59–76; idem, "An Astral-Magical Pneumatic Anthropoid," *Incognita* 2 (1991): 9–31; Schwartz, *Studies on Astral Magic.*

[10] See G. Freudenthal, "Maimonides' Stance on Astrology in Context: Cosmology, Physics, Medicine, and Providence," in S. Kottek, ed., *Moses Maimonides: Physician, Scientist and Philosopher* (Northvale, NJ: Jason Aronson, 1993), pp. 77–90; repr. in idem, *Science in the Medieval Hebrew and Arabic Traditions* (Aldershot: Ashgate, 2005). Underlying these intermediate positions was a weak point of the Aristotelian paradigm itself, related to the heat of the sun (see text at n. 47). Aristotle's successors had to argue that the sun's "action" was based on the element "fire" (and that of the moon on water), but they had no explanation for this action. This paved the way for the introduction of various kinds of influences attributed to other stars and planets, as noted by Maimonides: "From there astrology comes in" (*Guide of the Perplexed* II, 12). See also J. Longrigg, "Elementary Physics in the Lyceum and Stoa," *Isis* 66 (1975): 211–29; G. Freudenthal, *Aristotle's Theory of Material Substance* (Oxford: Oxford University Press, 1995), p. 104. On Maimonides, see also Schwartz, *Studies on Astral Magic*, Ch. 3.

to do so, he disguised those ideas through techniques of esoteric writing. Because of their resemblance to idolatry, his reluctance to articulate them openly is not surprising.[11]

Astral magic and the doctrine of *segullot* indeed loom large in many passages in *Sefer ha-Kuzari*. Halevi appealed to "experience" to explain the effect of the commandments, thereby endowing the doctrine of *segullot* with considerable theological significance. He examines the notion of "experience" at the beginning of the work, namely in the king's rebuttal of the Christian position (I, 5). The Khazar monarch states his rejection as follows:

> Such a faith [i.e., the Christian] leaves no place for logic (*qiyās*); moreover, logic rejects most of the things you have said. However, when both appearance and experience (*tajriba*) have convinced a person of the truth of some thing, so much so that the whole heart believes in it and has no choice but to believe in the thing of which he has been convinced, he will devise a subtle subterfuge to counteract logical inference, so as to bring that incredible thing closer. That is how natural philosophers deal with wondrous powers (*fī al-khawāṣ al-gharība*) that are revealed to them for the first time, powers of which, had these philosophers been told of them before seeing them with their own eyes, they would have denied their existence. However, after having seen them, they proceed with subtlety and devise causes for them, whether in the influence of the stars or in spiritualities (*ruḥāniyyāt*), and they will not reject the evidence of their eyes. But I find myself disinclined to accept these things as true, because they are entirely new to me, not having grown up with them. It is incumbent upon me, therefore, to investigate the matter fully.[12]

Judah Halevi was well acquainted with the principles of Aristotelian science; this passage reveals his profound understanding of its inner logic and the dynamics of its development. The first argument against the Christian's position indicates that logic (*qiyās*) is usually a sufficient criterion for judging affirmations: Whatever follows from the Aristotelian postulates by deductive logic is considered to be a possible phenomenon. Consequently, when the Aristotelian natural philosopher is confronted by a phenomenon that is inconsistent with the Aristotelian paradigm, he tends to deny it. However, when he finds that the existence of some such phenomenon is verified beyond doubt by experience, he is obliged to expand his paradigm by adding postulates from other doctrines. Specifically, the "wondrous powers" of substances are explained by appealing to the influence of the stars and "spiritualities." Therefore, the expression "wondrous powers" applies to powers that do not follow from the Aristotelian theory, but are rather inferred from experience (*tajāriba*). They are ascribed to stellar influence on the terrestrial world. Halevi maintains that there are facts highlighted by astrology and astral magic and that they are inexplicable in terms of the natural sciences, but must be acknowledged.

Judah Halevi and Abraham Ibn Ezra knew each other. Ibn Ezra was the major thinker of the twelfth century who focused on astrology and introduced it into Judaism.[13] His theological writings often draw on astral-magical exegesis, as in the following examples:

- Ibn Ezra lays down a rule: "The heavenly decree will not be nullified unless by giving a substitute, and this is a great mystery" (short comm. on Exod. 12:7). The function of sacrifices is therefore to channel the negative astral forces emanated by the stars to the animals or birds being sacrificed (on Lev. 1:1). This function also explains the command to smear the lintel and the doorposts with blood just before the Exodus from Egypt (long comm. on Exod. 12:7).

[11] See S. Pines, "On the Term *ruḥaniyyāt* and Its Origin, and on Judah Halevi's Doctrine," *Tarbiz* 57 (1988): 511–40 (Heb.).

[12] *Kitāb al-radd wa-ʾl-dalīl fi-ʾl-dīn al-dhalīl* (*Al-Kitāb al-Khazarī*), ed. D. H. Baneth and H. Ben-Shammai (Jerusalem: The Magnes Press, 1977), pp. 8–9, lines 1–4, 24–28.

[13] See Shlomo Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003).

- On several occasions in his Bible commentary, Ibn Ezra alludes to the role of the Tabernacle and its utensils as talismans that bring down "spirituality." For example, "Here is the rule: each cherub was fashioned to receive supernal power" (long comm. on Exod. 26:1).
- Sacrifices, even those offered before the theophany on Mt. Sinai, function as a catalyst of or hindrance to the action of stellar forces (on Gen. 8:21).
- The times of the festivals are determined by astrological configurations (on Lev. 23:24). It is most unlikely that Ibn Ezra disregarded the magical and theurgical significance of these calculations.
- Ibn Ezra, who likens the order of the tribes in the desert to a definite stellar configuration (on Num. 1:19), clearly presupposes the possibility of capturing stellar influences.

Ibn Ezra's astral-magical beliefs also underlie his interpretation of certain instances of misconduct, such as the various cases of *terafim*, the sin of the golden calf, the brass serpent, and Balaam's selection of locations for his altars. Yet Ibn Ezra does not always state his ideas openly. He perfected esoteric techniques of writing to conceal his astral-magical ideas: At times he only avoids the use of astral-magical terms but still alludes to them, and in other instances he ostensibly rejects astral-magical concepts but actually embraces them. However, in his scientific writings, most of which are devoted to astrology, Ibn Ezra unreservedly expresses astral-magical ideas here and there. The difference between the attitudes expressed in the two kinds of writings may be attributed to the difference between the prospective readers of the biblical commentaries (the general public) and those of the astrological writings – astrologers, whether professional or novices.

His extensive astral-magical interpretation of the commandments and of biblical events notwithstanding, Ibn Ezra occasionally describes the attraction of stellar spirituality as idolatry (e.g., long comm. on Exod. 20:3; comm. on Deut. 4:15). Yet, the qualification of the practice of astral magic as star worship did not necessarily depend on the technique involved: Stellar forces could be captured both through idolatrous ceremonies, when the stars were actually worshiped, and through procedures designed to bring down "spiritualities" that had nothing to do with idolatry. The distinction between legitimate astral magic and star worship depended on the celebrant's intent and the similarity of his practice to actual astral worship. For the astral worshiper, attracting heavenly powers was part of idolatrous religion or an intermediary agent in the worship of the deity; for the healer or simple practitioner of astral magic, it was a purely utilitarian act, a beneficial procedure in the material and religious realms.

In contrast, in his writings, Maimonides launches an uncompromising assault on the reality of magic.[14] He describes different levels of magic and sorcery, distinguishing between "folk" magic and "learned" (that is, astral) magic. Although he denies the reality of magical acts of any sort, he considers it a special challenge to divest "learned" magic of its pseudo-scientific cloak and thereby demonstrate its falsehood. In *The Guide of the Perplexed* (III, 37)

[14] See, e.g., Thorndike, *A History of Magic and Experimental Science*, Vol. II, pp. 205–13; Harry S. Lewis, "Maimonides on Superstition," *Jewish Quarterly Review* (o.s.) 17 (1905): 474–88; Leon Nemoy, "Maimonides' Opposition to Magic in Light of the Writings of Jacob al-Qirqisani," *Ha-Rofé ha-ʿIvri* 27(1–2) (1954): 102–9 (Heb.). See also Yitzhak Heinemann, *The Reasons for the Commandments in Jewish Literature* (Jerusalem: Horev, 6th ed., 1993 [1966]), pp. 91–2 (Heb.); Isadore Twersky, *Introduction to the Code of Maimonides* (New Haven, CT: Yale University Press, 1980), pp. 479–84; idem, "Halakhah and Science: Perspectives on the Epistemology of Maimonides," *Shenaton ha-Mishpat ha-ʿIvri* 14–15 (1988–9): 135–40 (Heb.); B. Safran, "Maimonides' Attitude to Magic and to Related Types of Thinking," in B. Safran and E. Safran, eds., *Porat Yosef: Studies Presented to Rabbi Dr. Joseph Safran* (Hoboken, NJ: Ktav, 1992), pp. 93–110. On Maimonides' attitude to astrology, see Y. Tzvi Langermann, "Maimonides' Repudiation of Astrology," *Maimonidean Studies* 2 (1991): 123–58; Freudenthal, "Maimonides' Stance on Astrology in Context"; Haim Kreisel, "Maimonides' Approach to Astrology," *Proceedings of the Eleventh World Congress of Judaic Studies*, Section C, Vol. 2 (Jerusalem 1994), pp. 25–32 (Heb.).

he divides into different categories those forms of magic whose reality he denies: (1) practices based on the use of forces inherent in existing objects, inanimate or animate; (2) acts whose supposed efficiency derives from their performance at certain prescribed times (*bitaḥdīd zamān* [i.e., by determination of the time]); and (3) practices based on particular human actions, such as dancing, clapping hands, or shouting. Maimonides then classifies magical practices into two categories: (1) those that involve all three of those characteristics and (2) those based on only one of them. He associates the latter kind of practices with women, thereby expressing his opinion of their intellectual inferiority. In his view, there is a qualitative difference between the two sorts of magical practices.

Maimonides also distinguishes between magic and the doctrine of *segullot*. Maimonides mentions numerous *segullot* in his medical writings.[15] In the *Guide* (III, 37) he discusses them in connection with "the ways of the Amorites" (*darkei ha-ʾemori*). He writes that *segullot* are real if two conditions are met: The properties in question are confirmed by experience, and their action can be explained without reference to astrology. This idea underlies Maimonides' explanation of the commandment of *ʿorlah* (the prohibition of eating the fruit of a tree during its first three years of growth) as directed against magical methods used to hasten the production of fruit. Such practices are based on *segullot* that fail to meet the two conditions described earlier. First, despite popular belief, their efficacy has not been verified; second, these attempts employ a "method . . . of the same character as the talismans" in conjunction, moreover, with "the sun's entering into a certain degree [of the Zodiac]," that is, a certain astral configuration. This association of *segullot* with astrology renders them invalid and halakhically prohibited.

Despite Maimonides' profound influence on medieval thinkers, his objections to sorcery impressed only a few. Most thinkers adhered to the paradigm of occult traditions. Some even argued that Maimonides' opposition to sorcery was not as firm as it seems at first glance.

ASTRAL MAGIC IN FOURTEENTH-CENTURY RATIONALISM: CAUSES

In the first half of the thirteenth century, astral magic largely disappeared from the writings of the rationalists; perhaps it went underground. It would seem, therefore, that Maimonides' attack was effective. However, during the later thirteenth century and the fourteenth century, there was a significant upward shift in the position and prestige of astral magic in Jewish thought. Hitherto an enigmatic element, allusive and covert, it became a powerful exegetical and theological tool. A circle of thinkers produced numerous works offering astral-magical exegesis, both consistent and overt, of biblical and midrashic sources. The earliest members of this circle were two fourteenth-century thinkers, Solomon Alconstantini and Solomon Franco, who can be said to represent the first stage in the development of a structured magic-astral hermeneutics. In its second stage (1360–80), Samuel Ibn Zarza, Ezra Gatigno, and Joseph Bonfils elaborated the pioneers' ideas; and in its third stage (1380–1400), the major thinkers were Shem Ṭov Ibn Shaprut and Shem Ṭov Ibn Mayor.

This revival had its roots in several different developments. First, there was the social context: Many rationalists were healers who used astrologically based talismans. Next there was the exegetical context: Fourteenth-century thinkers "rediscovered" Ibn Ezra's Torah commentary, and some of them composed supercommentaries to it. Lastly, astral magic profited from the emergence of "astrological theology," in which the fundamental tenets of Jewish theology were explicated in light of astrology, as if the Torah had been given on Mount Sinai to direct humanity according to astrological imperatives. According to this

[15] See G. Freudenthal, "Maimonides' Philosophy of Science," in Kenneth Seeskin, ed., *The Cambridge Companion to Maimonides* (Cambridge: Cambridge University Press, 2005), pp. 134–66.

doctrine, those who observe the commandments will be saved from adverse astrological decrees and enjoy success, but those who disobey them will be left to the fate predestined by the stars. This doctrine found expression in a variety of areas.

Biblical and midrashic exegesis explained entire chapters of the Bible on an astrological basis. For example, the Exodus from Egypt was said to have taken place at the time of "the great conjunction," when "Saturn and Jupiter were in conjunction in the Zodiac; it was then that their constellation was appropriate and He took them out of their exile in Egypt."[16] The Ten Plagues are explained at length as brought about by the heavenly configurations, that is, by the relative positions of the planets in the different signs of the zodiac.[17] Alconstantini offers the following comment on the Israelites' sins in the wilderness:

> Because they were in the wilderness, the patron of the wilderness [Mars] ruled over them. . . . And the power emanating from it is nothing but incest and bloodshed: these [incest and bloodshed] are his emissaries and they are his [Mars's] witnesses. Because [Mars] rules over man and blood prevails over man's temperament, these things of necessity came true.[18]

In other words, the influence of Mars produced the Israelites' grave sins. Alconstantini has no scruples about referring to these influences as necessarily bringing about their effects.

Astrological theology assumed that prophecy was based on accurate knowledge of the celestial positions, which determined both the prophet's "disposition" to receive prophecy and the content and nature of the prophecy. For example, Solomon Alconstantini argues that the prophets determined the times of their actions "on certain known days" on the basis of astrological considerations.[19] Moses' prophecy, too, was based on such considerations. Referring to the legend that Moses' neck was hardened like an ivory pillar and that Pharaoh brought a "sharp" astrologer who attempted to use the sword on him seven times,[20] Alconstantini writes,

> That sharp one determined the time at which he would be able to impair Moses' power with the assistance of the seven servants (Heb. *mešaretim*, i.e., planets). He therefore applied [the sword] seven times to [Moses'] neck: he applied those seven powers at time[s] he calculated would harm [Moses]. But since Moses' power was superior to that of the seven they could not harm him, his neck having become like an ivory tower: owing to his power and the greatness of his merit, [his neck] became like an ivory tower. And you find similarly in the case of Jeremiah, when he began to prophesy to the Lord, "I make you this day an iron pillar and a fortified city" [*sic*] etc.[21]

Alconstantini goes on to note that these were the first steps in Moses' prophetic career; the reference to Jeremiah implies a generalization of the principle. According to Alconstantini, then, a prophet has his first experience of prophecy when he is able to rise above astrological considerations. For example, Moses was able to withstand Pharaoh's astrologer; Alconstantini actually makes Moses' superiority as a prophet depend on astrological factors.

16 Shem Ṭov Ibn Mayor, *Ha-ma'or ha-gadol*, MS Oxford Bodl. 228, f. 103r.

17 See Dov Schwartz, "Astrology and Astral Magic in the Writings of R. Salomon Alconstantini" (Heb.), *Jerusalem Studies in Jewish Folklore* 15 (1993): 45–6. Such an interpretation is also suggested by the context in a sermon by another author; see Dov Schwartz, "A Sermon Concerning the Exodus from Egypt by R. Vidal Joseph de la Caballeria" (Heb.), *Assufot: Annual for Jewish Studies* 7 (1993): 261–80, esp. 277–9.

18 *Megalleh ʿamuqqot*, MS Vatican 59, f. 75v.

19 Ibid., f. 7r.

20 See Exod. Rabbah 1:31 (with "ten" rather than "seven"); cf. J Berakhot 9:1.

21 *Megalleh ʿamuqqot,* f. 55, referring to Jer. 1:18.

It follows that a person could not attain perfection without knowledge of the celestial configurations and movements, a precise knowledge of stellar influences, and the ability to rise above such influences. Solomon Ibn Yaʿish (first half of the fourteenth century) declares that "man's wisdom and intelligence are dependent on the heavenly hosts."[22]

In addition, astrological notions were used to explain the Jewish people's uniqueness. According to Solomon Ibn Yaʿish, "Israel were born under the planet Saturn, which indicates and dictates exile."[23] Many thinkers expressed similar views as they explained the historical fate of the Jewish people in terms of their astrological disposition.

They also described the Patriarchs as accomplished astrologers. According to Levi ben Abraham ben Ḥayyim (second half of the thirteenth century),

> Abraham was learned in astrology. . . . He knew the significance of the astral configuration of each and every day. God, blessed be He, communicated to Abraham in a prophetic vision his knowledge of these great things [the destruction of Sodom] that He wished to bring about through these angels [= heavenly bodies] and which he [= Abraham] had not accomplished through his learning.[24]

Shem Ṭov Ibn Shaprut declared that "Noah was learned in astrology and tried every fourth [aspect] to know whether there had been a change therein,"[25] that "Job's companions were learned in the wisdom of the constellations and proficient in astrology,"[26] and that the planet Jupiter was Abraham's guardian spirit, "for Jupiter was always at his feet."[27]

Most of the thinkers mentioned in this section were members of a well-defined philosophical circle, which combined the study of *The Guide of the Perplexed* and its heritage with intensive activity to discover Ibn Ezra's "secrets." Yet, other Spanish thinkers of the time, such as Hasdai Crescas and his disciples, also engaged in astrological theology and astral-magical interpretation of the Scriptures. The echoes of astrological theology reached as far as Byzantium, where we find such figures as Judah Mosconi (b. 1328; fl. 1360–72) and Elnathan Kalkish (completed his book *Even Sapir* in 1368) applying astrological and astral-magical exegesis to the Bible.

[22] Supercommentary to Ibn Ezra on the Torah, MS Vatican 54, f. 240^{r}.

[23] Ibid., ff. 274^{v}–275^{r}.

[24] *Livyat Ḥen* (short version), MS Munich 58, f. 57^{v}. The angels here are the stars: Levi describes the destruction of Sodom by "Gabriel, who is the sun, and it is he, who drives the element of fire, who brought down in God's name fire and sulfur to destroy Sodom." After Levi, the destruction of Sodom was often explained in astrological terms. Thus Solomon Franco, quoting from *Sefer ha-Dibbuqim* ("Book of Conjunctions"), writes, "For when the superior stars were conjoined in the sign of Gemini, they brought down on earth fire and sulfur and many nations died" (supercommentary on Ibn Ezra's Torah commentary, MS Oxford 1258, f. 57^{r}). Interestingly, Alconstantini believed that Abraham, at the beginning of his career, was "an astrologer but not a perfect prophet" (*Megalleh ʿamuqqot*, f. 35^{r}). In other words, there were no doubts about Abraham's mastery of astrology.

[25] *Ṣafenat paʿneaḥ*, MS Oxford, Bodl. 2350 (Opp. Add. 4° 107), f. 28^{v}. See Dov Schwartz and Dov Frimer, *The Life and Thought of Shem Tov Ibn Shaprut* (Heb.) (Jerusalem: Hebrew University, 1992), pp. 64–5. The fourth aspect is that in which there are three "houses" between one sign and the next. The fourth aspect between the sun and the moon repeats itself approximately once a week. Note that Samuel Ibn Matut, a kabbalist and contemporary of Ibn Shaprut, in his supercommentary on Ibn Ezra's Torah commentary, also stated that "Noah was proficient in astrology" (*Megalleh setarim* [Venice 1554], p. 10d).

[26] *Pardes rimmonim* (Sabbioneta, 1554), p. 6b. Ibn Shaprut refers to the story that Job's comforters entered all at the same time and argues that the reference to a precise moment is evidence of the astrological context (see b BB 16b, though our text reads "through one gate" [Heb. *šaʿar* instead of *šaʿah*]).

[27] *Meqor Ḥayyim* (Mantua, 1559), f. 16d. This explains the verse "the Lord blessed Abraham in all things" (Gen. 24:1) with the comment that Abraham had escaped from the influence of Saturn and entered that of Jupiter. See also *Megalleh ʿamuqqot*, f. 3^{r} (quoted in Schwartz, "Astrology in Alconstantini," p. 63, lines 18ff.). As the language editor kindly pointed out to me, "For Jupiter was always at his feet" alludes to Isa. 41:2.

ASTRAL MAGIC IN FOURTEENTH-CENTURY RATIONALISM: APPLICATIONS

In the fourteenth century, as a result of the developments described earlier, the theological doctrine of astral magic became a powerful exegetical tool.[28] Many thinkers, whom we can describe as forming a circle, accepted it without question as an ancient esoteric lore. For example, in an important supercommentator on Ibn Ezra, Joseph Bonfils (Ṭov Elem), writes,

> This is the way of the wise men of India, who make metal effigies at certain times to bring down the powers of the stars. This is a great science, about which there are many books. I am acquainted with Ishmaelites who are conversant with it and I myself know some of it, but theoretically and not practically, for it is in truth idolatry.[29]

Bonfils characterizes astral magic as idolatry to conceal his adherence to it: When he explains the use of the staff during the Ten Plagues, he affirms that it was a talisman used to bring down stellar forces. Solomon Alconstantini also attributes at least some of the plagues to the use of astral magic, portraying Moses as a magician.

The main exegetical application of astral magic was to explain the reasons for the commandments. It characterized many of their details as techniques to attract stellar "spiritualities." Astral-magical exegesis was at its best in providing a compelling explanation for the Tabernacle and the Temple as talismans to capture stellar forces. The point of departure for all these commentators was the posited analogy between the Tabernacle and the world of the heavenly bodies: The Tabernacle and its utensils symbolized the stars and the constellations. Based on that principle, it was almost natural to present the various Temple utensils as tools to attract stellar forces and "bring down emanations" (a common phrase in Alconstantini's work).

In parallel, these commentators explained "demons" as a negative "spirituality" emanating from the stars. At an earlier stage, members of the circle denied demons any reality, describing them as products of a diseased imagination or as hallucinations. Later, however, they recognized them as real and identified them with heteronomic forces originating in the stellar world ("spirituality"). The change in attitude resulted from the discovery of a translation, ascribed to Abraham Ibn Ezra, of a Hermetic work, *Sefer ha-ʿAṣamim* (Book of Substances), in which demons were described as forces originating in the stars. Shem Ṭov Ibn Shaprut and Shem Ṭov Ibn Mayor stated explicitly that they had changed their minds under the influence of *Sefer ha-ʿAṣamim.*

These fourteenth-century Spanish rationalists postulated a clear distinction between astral magic, which was real and valid, and other forms of magic. Consequently they asserted that astral magic was not included in the biblical and talmudic definitions of sorcery, and could be integrated into theology and become an important exegetical tool. However, they considered sorcery in its diverse forms to be fraudulent and an illusion, and therefore forbidden. Here again we have the differentiation between "learned magic," which is not considered to be sorcery, and "folk magic," which is unreal and prohibited.

SEGULLOT IN FOURTEENTH-CENTURY RATIONALISM

The doctrine of *segullot* was first mobilized for theological purposes in the fourteenth century. In his *Derašot* (homilies), Rabbenu Nissim ben Reuben (known as the Ran; ca. 1290–1376) interprets talmudic discussions of various *segullot.* He explains that an object has an overt nature and a covert nature: The former results from a "natural action" (*poʿal ṭivʿi*), which

[28] This section is based on Schwartz, *Studies on Astral Magic,* ch. 4.

[29] *Ṣafenat paʿneaḥ,* ed. D. Herzog (Cracow, 1912), 1: 245.

is always present in that object, the latter, from a "specific action" (*poʿal segulli*), which is only a potentiality.[30] An example of the overt nature is the combustibility of a substance, and of the covert nature, its healing property (i.e., its *segullah*, its covert essence). Rabbenu Nissim thus explains magnetism as the property of a stone "in whose nature is the power of attraction," adding that it exemplifies the "power of a *segullah*." In contradistinction to the essential form, whose action may be attributed to the object's qualitative structure, the action of *segullot* is revealed by experience, but is inexplicable on that basis. Rabbenu Nissim further emphasizes that certain *segullot* are instruments for the reception of angelic and stellar forces. Hence, through the proper preparation of a substance, one can bring down and draw to it emanations from the upper worlds and thus uncover its hidden powers. On this basis, Rabbenu Nissim characterizes idolatry not as the use of astral magic, but rather as the attribution of the astral powers to the angels and the stars themselves, rather than to the creator.[31] Rabbenu Nissim's disciple, R. Joseph of Saragossa, similarly defines *segullah* as "hidden nature" and links *segullot* with the capacity to connect with "a heavenly power."[32]

The idea that *segullot* are the forms of substances whose actions are not a consequence of their qualitative structure also appears in the works of certain thinkers of the Neoplatonic circle active in Spain in the mid-fourteenth century. Samuel Ibn Zarza (ca. 1360–80), drawing on Averroes, formulates the principle of "specific properties" as follows:

> For the Master of blessed memory [= Maimonides] wrote in the aforementioned chapter [*Guide* III, 37] that they [= idolaters] caused [others] to believe in [*segullot*], or they themselves believed that they performed wondrous deeds through forces and *segullot*. One should not wonder at this, for, as Averroes says, every single existent has an infinity of specific properties [*segullot*], and there is a relationship between each and every form, so that every existent necessarily changes depending on the existent[s] to which it is relating; in addition, their combinations give rise to other relationships.[33]

Thus, every object contains an infinite number of *segullot*.

The doctrine finds its theological application in the writings of a variety of thinkers. Solomon Alconstantini describes Jethro as a magician proficient "in knowledge of the *segullot* of things, which act in accordance with all their inherent properties. The natural philosopher is at a loss to provide natural causes for their action: he cannot infer from the nature of an object . . . its action by virtue of its form."[34] Alconstantini writes that it was Jethro who advised Pharaoh to kill the male infants born to the Israelites.[35] Yet how would the sex of the fetus be identified before its birth? "Through sorcery and knowledge of the *segullot*" or "through the *segullah* and not through nature." In other words, Jethro taught the Egyptian midwives a *segullah* to predict the sex of the fetus before birth. On another occasion, Alconstantini explains the use of hyssop on the Passover in Egypt (Exod. 12:22) as a *segullah* to prevent decay and impurity.[36] In his words,

30 *Derašot ha-Ran*, ed. L. A. Feldman (Jerusalem: Makhon Shalem, 1977), pp. 220–2.

31 Ibid., pp. 58–9. Shem Ṭov Ibn Shem Ṭov discusses *segullot* in the chapter devoted to sorcery; see *Sefer ha-ʾEmunot* (Ferrara, 1556), f. 49^{v}.

32 *Commentary on the Torah Attributed to a Disciple of R. Nissim b. Reuben*, ed. L. A. Feldman (Jerusalem: Makhon Shalem, 1970), p. 124.

33 *Meqor Ḥayyim*, f. 125a.

34 *Megalleh ʿamuqqot*, MS Vatican 59, f. 51^{r}. This description was quoted in the early fifteenth century by R. Vidal Joseph. See Schwartz, "Sermon Concerning the Exodus," p. 274.

35 This was Alconstantini's interpretation of the midrash in B Soṭah 11a: "There were three in that plan, namely, Balaam, Job, and Jethro."

36 See Dov Schwartz, "The Neoplatonic Movement in 14th-Century Jewish Literature: Its Relationship to Medicine" (Heb.), *Korot* 9 (1990): 279.

Know that the *segullah* of plants and herbs cannot be explained by human beings, and some of those engaging in experience have already said that one can attain knowledge of the nature and the *segullah* of things only by trying them out on thousands and thousands of people and in one thousand years of time. Similarly, they said that it is not inconceivable that they should possess a *segullah* for one [thing] in an infinity of ways, by analogy with the infinity of existents.[37]

The hyssop serves Alconstantini as an illustration that a substance may be "small in itself" and yet "have great *segullot*." Alconstantini similarly explains the role of the incense of the fire pans in the episode of Koraḥ and his companions as involving *segullot*, affirming that it was the specific powers of the burning incense that made the earth "open up its mouth."[38] By contrast, Joseph Bonfils explains that in that case the specific properties of incense acted to prevent decay.[39]

R. Shem Ṭov Ibn Shaprut offers an allegorical interpretation of the legend of King Solomon and Ashmedai (B Giṭṭin 68b), according to which Ashmedai represents a person proficient in the use of *segullot* – a talent that cannot be achieved by rational means but only through experience:

Do not wonder that there are many *segullot* that cannot be verified by reason, but only through experience. For example, there is a stone that will break upon passing over vinegar; and clay will break upon passing over a triangle; and quicksilver will break silver and gold. Now this matter was unknown to the wise men [i.e. natural philosophers] of those times.... [Yet] in their times there were people who lived in deserts and were proficient in these skills, [that is,] in the *segullot* of stones and metals and herbs, and they were accomplished masters of sleight of hand, for that skill is based on the knowledge of the *segullot* of things.[40]

Ibn Shaprut stresses that the doctrine of *segullot* is part of natural science and has nothing to do with sorcery. Thus he explains the talmudic passage (B Pesaḥim 109b–10b) concerning pairs this way: "It appears that the wise men of that time knew certain *segullot* regarding a person who drinks and eats in pairs, as mentioned in [that chapter of the Talmud]. But we do not know how they [the *segullot*] come to be, though they are natural actions."[41] The description of *segullot* as natural is the mark of a non-Aristotelian scientific tradition, whose proponents admitted that the powers of *segullot* could not be derived from the qualities of the substance but was known through experience alone.

A number of fourteenth-century thinkers maintained "that the commandments have many *segullot* that have a beneficial effect on body and soul."[42] However, it was Hasdai Crescas (ca. 1340–1410) who first offered a systematic interpretation of the Torah commandments in terms of *segullot*. The explanation appears in relation to the priestly benediction:

The Lord, blessed be He, placed specific *segullot* in the commandments, as in the case of medications. Just as medications act by virtue of their qualities and their entire substances, so the commandments of the Torah act similarly; and just as one medication may hinder the action of another, so it is with the commandments in regard to transgressions, for sometimes it is the *segullah* of one commandment to engender a certain physical benefit that protects [the body] against some transgression; or conversely, a certain transgression causes a certain physical harm and that harm precludes the performance of a commandment that possesses a beneficial *segullah*. Now, as has been explained in the Torah, the Lord, blessed be He, placed this *segullah* in the priests, to serve as intermediaries to receive benediction from

37 *Megalleh ʿamuqqot*, ff. 65r–66r.
38 Ibid., f. 100r.
39 *Ṣafenat paʿneaḥ*, ed. Herzog, 1: 83, referring to Num. 17:11.
40 *Pardes rimmonim*, p. 37a.
41 Ibid., p. 5b.
42 Isaac Aboab, *Menorat ha-maʾor*, "Conclusion of 'Third Lamp,'" ed. Y. Paris-Horev and M. H. Katznellenbogen (Jerusalem: Mosad Ha-Rav Kook, 1961), p. 487.

Him and bestow it upon Israel, and that is why they were commanded to raise[43] their hands aloft, as if they were receiving the benediction in their hands to bestow it upon Israel. It is commonly known that the hands are capable of being blessed, as [the Torah] says, "and to bless all the work of your hands" (Deut. 28:12).[44]

Thus *segullot* are used to explain the beneficial influence of observance of the commandments and the harmful influence of violating them. Crescas points out that, just as some medications lose their efficacy when mixed with others, so sins can obstruct the beneficial influence of the commandment; the converse is true as well. The doctrine of *segullot* thus provides a full explanation for the effects of the commandments.

Crescas applies the same principle to explain the efficacy of charms and magic spells. In his view, such magical actions do have some beneficial effect, but their efficacy raises philosophical and theological difficulties. The central question is as follows: Because a charm or magic spell is incapable of independent magical action, who is responsible for its effect? Crescas's answer is that the charm or spell is a kind of "tool" for the action of various agencies (God and the heavenly bodies) and of the perfect person. He explains the beneficial effect of magical acts on the basis of the doctrine of *segullot*: Just as the commandments of the Torah benefit those who perform them, though there is no scientific-Aristotelian explanation for their action, magical spells that rely on the influence of the stars or on divine influence are beneficial.[45] Crescas also appeals to another problem that refused to fit into the Aristotelian paradigm: How do the heavenly bodies (the sun and the moon) heat and cool the atmosphere, even though they do not possess qualities?[46] Thus, Crescas explains the efficacy of religious actions in terms of concepts and ideas typical of the non-Aristotelian scientific traditions, chief among them the doctrine of *segullot*.

THIRTEENTH- AND FOURTEENTH-CENTURY CONTROVERSIES ABOUT ASTRAL MAGIC AND *SEGULLOT*

Toward the end of the thirteenth century, a fierce controversy broke out in Provence between conservatives and rationalists. Although the main bone of contention was radical rational-allegorical exegesis of the Bible, the immediate trigger was the rationalists' use of astral magic for healing. The conservatives, headed by Abba Mari of Lunel, accused the rationalists of idolatry. Abba Mari tried but failed to drag R. Solomon ben Adret (Rashba; ca. 1235–ca. 1310) into the argument. Rashba noted that he himself, before the rise of the anti-philosophy controversy, had unhesitatingly permitted the fashioning of effigies for medical purposes; even while the controversy was raging, he refused to issue an absolute interdiction on the medical use of astral magic. In contrast to Maimonides' denial of the efficacy of magic, Rashba pointed out that both Talmuds contain an abundance of magical material that violates no religious precept. Moreover, he accused the opponents of magic of denying the possibility of miracles. To support the view that *pneumata* can be drawn down on talismans, he writes,

[43] Printed editions read here *le-Yisrael* "to Israel," instead of the correct *li-sa'* "to raise"; I have emended in accordance with W. Z. Harvey's forthcoming edition. See Z. Harvey, "Kabbalistic Elements in Crescas' *Or Adonai*" (Heb.), *Jerusalem Studies in Jewish Thought* 2 (1983): 107.

[44] *Or Adonai*, *ma'amar* 3, Part 2, Rule 1, ch. 2; quoted from first ed., Ferrara 1555.

[45] Ibid., *ma'amar* 4, *derush* 5. For astral magic in Crescas's thought, see Z. Harvey, "The Uniqueness of the Land of Israel in the Thought of Crescas" (Heb.), in M. Hallamish and A. Ravitzky, eds., *The Land of Israel in Medieval Jewish Thought* (Jerusalem: Yad Ben-Zvi, 1991), pp. 157–8; H. Kreisel, *Prophecy: The History of an Idea in Medieval Jewish Philosophy* (Dordrecht: Kluwer Academic Publishers, 2001), pp. 461–2.

[46] See Langermann, "Gersonides on the Magnet," pp. 276–82.

And I say that it was the kindness of the Supreme Being at the start of Creation to create in his world things that would ensure the health of the created beings, that if the existents happen to fall ill or for any other reason deviate from their natural perfection, these [things] are capable of restoring them to their proper state or to their health. And He placed these powers in the inherent properties of things found in nature, as may be apprehended by study, such as medications and remedies known to scholars of medicine, or in the nature of specific properties not apprehensible by inquiry.... And it is not impossible that such a power should also be in speech, as in the case of talismans and similar things.[47]

The possibility that stellar forces could be used to heal the sick was provided for in advance by God, Rashba argues. Whether such practices were permissible depended on the magician's inner intention: It was his awareness that God was the primary cause of recovery that legitimized the astral-magical practice. Thus Abba Mari was unable to persuade Rashba to join him in condemnation of astral magic.

Throughout the fourteenth century, the dispute became increasingly acrimonious; at least four positions on the status of astral magic can be distinguished:[48]

1. Astral magic is both false and forbidden. The moderate rationalists rejected astral magic of any kind and therefore also considered it halakhically prohibited. They accepted Maimonides' firm denial that astral magic had any reality and his prohibition of its practice. These thinkers took up Maimonides' approach in content, style, and language (e.g., Menaḥem ha-Meiri [1249–1316], David ha-Kokhavi [fl. 1290–1325]). Some rationalists chose almost to ignore the issue, probably because they attached no reality whatever to astral magic (Joseph Ibn Kaspi [1279–1332?]).
2. Astral magic is dubious and forbidden. This was the view of the traditionalists, who consistently battled the radical rationalists and in fact defined the latter group, inter alia, by their use of astral magic for medical purposes (Abba Mari, Jacob ben Solomon Ṣarfati [second half of the fourteenth century]). Like the moderate rationalists, they prohibited the practice absolutely, but did not entirely deny the possible reality of astral magic. Their most characteristic trait was their association of the practice of astral magic with the magician's affinity for philosophy: They believed that rationalist philosophy was bound to lead to the practice of astral magic.
3. Astral magic is false in respect of its physical reality, but psychologically effective, and is forbidden. Some circles denied that astral magic could actually capture stellar forces, but believed that there was some psychological benefit in its practice. Nevertheless, they, too, prohibited its use as a matter of halakhah (Gersonides [1288–1344], Jedaiah ha-Penini of Béziers [1270?–1340]). In a sense, this position can be considered as an intermediate one, though it is closer to that of the moderate rationalists, and its proponents were essentially a subgroup of them.
4. Astral magic is real and permitted. Some thinkers believed in the absolute reality of astral magic (Nissim of Marseilles [end of the thirteenth century], Frat Maimon [fourteenth century]) and even considered it to be halakhically legitimate (Levi ben Abraham). For such thinkers, astral magic was a theological principle that could be used to interpret various biblical passages.

The Provençal controversy left its mark in Spain as well, but in a much weaker form. Isaac Pulgar (first half of the fourteenth century) rejected astrology and astral magic entirely, but

47 *Minḥhat Qena'ot*, in Rashba, *Responsa*, ed. H. Z. Dimitrowski (Jerusalem, Mossad ha-Rav Kook: 1990), Part 1, Vols. 1–2, p. 302.

48 The following account is based on Schwartz, *Studies on Astral Magic*, ch. 5.

his was a lone voice.[49] A more common position among the disciples of Rashba and R. Asher ben Jeḥiel (Rosh; 1250–1327) was that astral magic was real, but its theological use as an exegetical tool should be limited. There were two reasons for this restriction: (1) Astral-magical exegesis of biblical and rabbinic texts was clearly of limited scope, and one should prefer the traditional rationalist exegesis; and (2) astral magic could not be considered an autonomous realm, recognized and permitted by the Torah and in fact supporting the Torah. The proponents of this stance were apprehensive of the dangerous affinity between astral magic and idolatrous cultic practices. This position aroused a lively dispute, with Abraham Alṭabib bitterly criticizing Solomon Franco, the author of a supercommentary on Ibn Ezra's Torah commentary. The main targets of his attack were astral-magical interpretations of the following topics: the utensils of the Tabernacle, the rationale for the commandment of the scapegoat, the rationales for the commandment of festivals, the reasons for ritually forbidden foods, and the reasons for forbidden sexual unions. Solomon Franco argued that he was not expressing his own opinions but merely revealing Ibn Ezra's intentions; however, this feigned innocence did not avert the dispute.[50]

The controversy also touched on the doctrine of *segullot* and the radical-rationalist exegesis that relied on it. One of Alṭabib's objections concerned the interpretation, in the light of the doctrine of *segullot*, of the midrash about the vine planted by Noah, which produced wine within a single day. Alṭabib held that Noah's activity was unnatural. Franco countered that it was a natural *segullah* and quoted Alṭabib's words in order to refute them:

> You [Alṭabib] have said of the midrash that on the same day that [Noah] planted [the vine] he drank of its wine,[51] that perhaps he knew some *segullah* to plant it and drink of its wine on the same day. And you brought proof from R. Akiva, of whom you said that he sowed cucumbers and ate of them the same day;[52] but that is not so. . . . For this [the rapid growth of Noah's vine] was more miraculous than Aaron's staff.
>
> The *segullah* by which R. Akiva planted the cucumbers, seek it in the second part of the book of *Al-Chirgas,*[53] where you will find it.[54]

According to Franco, Noah knew through his experience of a *segullah* that accelerated the growth and fruiting of the vine; he even referred Alṭabib to a specific source in the *segullot* literature where he would find a similar *segullah.*

These, then, are the two positions. Franco rejects any miraculous or supernatural nature of *segullot* and describes Noah as a scientist who discovers through experience a way to accelerate the harvest. In contrast, Alṭabib is a theologian who considers the production of wine on the day the vine was planted to be a full-fledged miracle ("one of the miracles and *segullot* that were in the Temple"). Being well aware that Alṭabib's concern was primarily theological and that he wanted to criticize the natural interpretation of miracles, Franco, through most of his response, tries to blur the distinction between miracles and nature, calling for support from distinguished authorities and sources (Maimonides, David Kimḥi).[55]

49 See Isaac Pulgar, *'Ezer la-dat* (Tel Aviv: Tel Aviv University Press, 1984), Part 3.

50 See Schwartz, *Studies on Astral Magic*, ch. 6.

51 Gen. Rabbah 36:4; Tanḥuma 58:13; Ibn Ezra, commentary on Gen. 9:20 (ed. Weiser, p. 44).

52 B Sanh. 68a.

53 Variant reading "Al-Nirgas," which is more probable. Franco is probably referring to a work entitled *Niranj,* attributed to Majriti. See M. Steinschneider, *Zur pseudepigraphischen Literatur* (Berlin, 1862), p. 73. I am indebted to Prof. Y. T. Langermann for this identification.

54 MS Oxford, Bodl. 1258, f. 96; quoted in D. Schwartz, *Amulets, Properties, and Rationalism in Medieval Jewish Thought* (Heb.) (Ramat Gan: Bar-Ilan University, 2004), pp. 333–5.

55 Note that in his response to this objection, Franco explains the miracles of the theophany at Sinai on the basis of the anthropological theory of miracles, in the spirit of Ibn Ezra. See, e.g., H. Kreisel, "Miracles in Medieval

Ezra Gatigno criticized Franco's interpretation on utterly different grounds. Referring to Franco's explanation of the rapid growth of the vine, he writes,

> I do not understand this explanation: If this was Ibn Ezra's view in regard to this midrash, why did he say that it was a secret? For according to this interpretation there was no reason to conceal this secret.[56]

For Gatigno, the explanation based on the doctrine of *segullot* was grounded in an elementary empirical fact, which need not be considered miraculous or esoteric. It was inconceivable, therefore, that Ibn Ezra should apply the term "secret" to *segullot*. Gatigno was thus espousing the rationalist position, which firmly rejected Alṭabib's criticism. For Alṭabib, however, any explanation expanding the limits of a *segullah*'s action, in regard to its speed and efficacy, was a direct challenge to the reality of miracles. Thus the controversy over *segullot* was rapidly becoming a controversy about miracles; as such it was a major element in the debate between traditionalists and rationalists in the fourteenth century.

ASTRAL MAGIC AND *SEGULLOT* IN FIFTEENTH-CENTURY RATIONALISM

The prevailing fifteenth-century attitude toward astrology and astral magic was that held earlier by the circle of R. Judah ben Asher (son of the Rosh; 1270–1349). Formulated in response to the controversies over the status of those two disciplines, it came to the fore in the century preceding the expulsion from Spain. Many thinkers, although critical of the considerable theological influence of astrology, nevertheless recognized its factuality. However, the case of astral magic was different, and it was approached with some uncertainty. The influence on Spanish-Jewish philosophy exerted by rationalists who had embraced astral-magical views had dwindled by the beginning of the fifteenth century, as may be discerned in the work of Vidal Joseph de la Caballeria, who was strongly influenced by Solomon Alconstantini.[57] From that time on, the traditional approach, which questioned the reality of astral magic, again became dominant.

Thus, Isaac Arama (1420–92) criticizes the consistent astrological interpretation of Jewish history found, for example, in the writings of Abraham Bar Ḥiyya. Yet he too recognizes the validity of astrology per se, as is evident in many examples. His attitude to astral magic is similar. In his lengthy explanation of the golden calf episode, he expresses profound doubts about the efficacy of effigy worship, but is unwilling to reject it out of hand. On the contrary, Arama proposes that the Israelites chose a bull "in order to bring down the emanation from the heavenly forms," because the bull is "the king of animals." Why had they not used the form of a lion? The answer is clear:

> According to the path of truth, although we do not wholly accept such things, we nevertheless take them into consideration. For it was precisely in the month of Av, when the zodiacal constellation of Leo rises every morning, that the crown of our splendor fell and our magnificent Temple was burned twice.[58]

In other words, although Arama is uncertain about astrological and astral-magical principles, they must nevertheless be heeded.

A similarly ambiguous attitude is taken by Abraham Bibago (mid-fifteenth century), for whom the main characteristics of astral magic were esotericism and dependence on place and time. Bibago questions the reality of what he called "this science" and carefully delineates its

Jewish Philosophy," *Jewish Quarterly Review* n.s. 75 (1984): 117–18; A. Ravitzky, "The Anthropological Doctrine of Miracles" (Heb.), *Jerusalem Studies in Jewish Thought* 2 (1982): 79.

56 *Sod Adonai li-yre'aw*, MS Munich 15, f. 255^{v}.

57 On Vidal Joseph de la Caballeria, see Schwartz, "A Sermon."

58 *ʿAqedat yiṣḥaq*, §53.

limitations, but he does not reject it outright. Some moderate astral-magical interpretations may also be detected in the comments on the sacrifices by Isaac Abravanel (1437–1508). Clearly, then, astral-magical doctrines were in a decline and had been ideologically marginalized. Rational treatises systematically explaining biblical chapters on astral-magical grounds were no longer common; the situation was no different among Spanish rationalist thinkers after the expulsion.

Yet, some fifteenth-century thinkers continued to explain the commandments on the basis of the doctrine of *segullot*. For example, Joseph Albo (ca. 1380–ca. 1444), declared that each and every commandment in the Torah has "a specific *segullah* of its own."[59] Abraham Saba (d. ca. 1508), an exile from Spain, offered a particularly interesting version of this approach, following Crescas and Albo. Saba describes the "wisdom" inherent in performance of a commandment, based on the doctrine of *segullot*:

> He [God] said, "you shall be my *segullah* among all the peoples" (Exod. 19:5), meaning that Israel were called a special people among all the peoples because they have the Torah and the commandments, which possess wondrous qualities (*segullot*).... For the commandments have an effect that is supernatural. For we see that one cantor is wrapped in his prayer shawl when he recites the Thirteen Attributes, or similarly, "Who causes the wind to blow and the rain to fall," and he halts the plague without any reason and not as required by nature. For there is no connection between one and the other, but they act in this respect through a wondrous *segullah*, the *segullah* of the Torah and the commandments, which has a specific property (*segullah*) of bringing death or life, and bringing down rain or stopping a plague. Therefore Israel was called a wise and discerning people, as it is said, "That nation is a wise and discerning people" (Deut. 4:6). That is the meaning of "observe them carefully, for that will be proof of your wisdom," etc. (ibid.), when they [= the nations] see that your actions are not natural but by means of *segullah*.... For even if you perform the commandments without reason you will be considered wise, for you are activating a *segullah* by performing the commandments.[60]

This passage expresses several fundamental tenets of Saba's thought. First, the commandments achieve their effect through *segullot*, that is, through empirically verified means. Second, both the commandments and the *segullot* are defined as supernatural, literally "above nature" – a term used in direct opposition to "natural actions." Thus Saba rejects the "scientific" accounts of the doctrine of *segullot*. Third, the superiority of the Jewish tradition derives not from understanding the meaning and causes of an action, but from the sheer efficacy of its consequences, as in the example of the rain falling or the plague being checked by virtue of prayer and performance of the commandments. This is a rejection of the Aristotelian-rationalist principle that science or wisdom consists of knowledge. For Saba, effects brought about on the basis of experience are preferable to "natural actions" and, paradoxically, are the measure of "wisdom."

In another passage, Saba reemphasizes the dependence of the commandments on *segullot*:

> In this commandment there are several kinds of different benefits and *segullot*. For just as there are several actions in the element of fire, none resembling the other – for fire melts and freezes, causes to grow and to wither, and moreover has the power to illuminate – so the commandments possess several *segullot*, and they illuminate.... And this is true not only of fire; but there are also in the world several kinds of drugs and medicines that possess several natures and *segullot*. Thus if a created object, whether in heaven or on earth, possesses several kinds of actions and *segullot*, how much more so

59 Joseph Albo, *Sefer ha-ʿIqqarim* 4:20, ed. I. Husik (Philadelphia: Jewish Publication Society, 1946), IV, p. 179, line 7.

60 *Ṣeror ha-mor* (Warsaw, 1879), Exodus, p. 16b. Saba repeats the same idea, in more general terms, in his commentary on Deuteronomy, p. 5a. He stresses there that the designation of the Torah commandments as "wise" is an act of divine love, although no actual wisdom is involved from a logical standpoint. He concludes, "Israel is a great nation, they are all wise, all intelligent, and all know the Torah, so that through their observance of the commandments He is close to them and answers their prayers."

the commandments of the Torah, which is a precious object endowed with several kinds of desirable qualities and a *segullah.* Just as in each of the four elements or other compound things, in each and every one, there is a unique nature distinguishing it from another, so in each of the commandments there is a *segullah* distinguishing it from other commandments; and just as bread is effective against hunger, water against thirst, heat against cold, and clothing against nakedness, and each fulfills a need different from that of another, so each and every commandment is effective in regard to the matter for which it is intended.[61]

In this passage Saba points out the *segullah*-like properties of various pharmaceuticals ("drugs and medicines") and considers the commandments an integral part of this world of *segullot.* He has thus joined the ranks of the traditionalists, who used the doctrine of *segullot* and their dependence on experience to describe the commandments as an expression of wisdom, on the one hand, and to emphasize the efficacy of the *mitzvot,* on the other. Each commandment has many beneficial results that cannot be explained scientifically.

Because Saba fervently advocated the superiority of practice to theory – "the only purpose of study and education is to promote practice"[62] – there is no doubt about the theological significance that he attributed to experiential science. Saba had clearly marshaled all the means at his disposal to distance religious praxis from the scientific and philosophical positions. The reasons for the commandments cannot be known by the natural scientist or the philosopher. Whoever seeks to understand the real meanings of the commandments must necessarily enter realms of thought not susceptible to theoretical scientific knowledge. Just as the concept of miracle relies on these realms, the same is true of the efficacy of the commandments, which is "above nature." Saba's thinking regarding the commandments may therefore be viewed in the context of the criticisms hurled at philosophy in his time, such as the very harsh critique by Joseph Jabez (1438–1507).

MAGNETISM AS A PARADIGMATIC *SEGULLAH*

Magnetism was often cited in discussions of *segullot* and served as a paradigmatic example of a property irreducible to the lodestone's components.[63] From an Aristotelian perspective, the phenomenon of magnetism arouses two questions:

1. What links the magnet, as an attractor, to the iron, the attracted matter?
2. According to Aristotelian physics, a material body can be moved by direct contact only; how does the magnet move the iron from a distance?[64]

Gersonides seems to express two conflicting viewpoints on magnetism. In his supercommentary on Averroes' commentary on the *Meteorologica,* he writes that magnetism is to be explained by means of a *segullah,* a concept that originated in pharmacology, where it relates to medicines whose mode of operation cannot be attributed to their particular elemental composition.[65] Gersonides thus attributes magnetism to the *segullah*-like property of material. In *Milḥamot Adonai* (V, 2, 5), however, Gersonides' discussion of electrical fish implies

61 *Eškol ha-kofer* (Drohobycz, 1904 [repr. Jerusalem, 1981]), Ruth, p. 22b. Cf. the careful discussion by Abraham Gross, *Iberian Jewry from Twilight to Dawn: The World of Rabbi Abraham Saba* (Leiden: Brill, 1995), pp. 86–8.

62 *Eškol ha-kofer,* Esther, p. 11. Cf. Joseph Jabez: "[David] considered knowledge to be preparation and praxis to be the goal" (*Or ḥayyim,* p. 13a). See G. Nigal, "Opinions of R. Joseph Yawetz on Philosophy and Philosophers, Torah and Commandments" (Heb.), *Eshel Beer-Sheva* 1 (1976): 281–3.

63 See S. Pines, *Studies in Islamic Atomism* (Jerusalem: Magnes Press, 1997), pp. 162–4.

64 Langermann, "Gersonides on the Magnet," p. 269, where the history of thought on magnetism is described.

65 Ibid., pp. 273–4.

that the action of the magnet follows from the four material elements. Yet, from a theological point of view, Gersonides was plainly inclined to limit the scope of Aristotelian science.[66]

Magnetism became an important element in Jewish thought in the fourteenth and fifteenth centuries, serving as a theological weapon against the certainty that many thinkers attributed to science. The point was that magnetism could not be explained on scientific grounds and could be known only through experience; it was therefore inconsistent with the Aristotelian paradigm. A few examples suffice to illustrate this point.

The author of *Sefer ha-Ḥinnuḵ* uses magnetism in reaction to scholars who give precedence to scientific research over tradition. Magnetism demonstrates the impotence of scientific research in God's world.[67] Rabbenu Nissim of Gerona uses magnetism to argue that the essence of objects is not susceptible to intellectual study.[68] Joseph Albo uses the phenomenon to confirm the doctrine of the resurrection of the dead.[69] Finally, the anonymous author of *ʾIggeret ha-tešuvah* cites magnetism in support of his argument that it is the practical commandments that imply the immortality of the soul.[70]

Gersonides' stance thus reflects a common tradition that considered magnetism to be a deviation from Aristotelian science. Yet Gersonides was philosophically and theologically far removed from the thinkers who took an apologetic approach to the question of revelation and philosophy. To the same degree, he was in no way inclined to expand the concept of *segullah* and associate it with magic, as did Spanish commentators and thinkers in the second half of the fourteenth century. I believe that this background explains Gersonides' wavering between the identification of magnetism as a *segullah* (in the commentary on *Meteorologica*) and his explanation of it within the frame of the Aristotelian regularity of the material world (*Milḥamot Adonai*).

The revival of astral magic and the doctrine of *segullot* in Renaissance Italy constitute a separate topic, beyond the scope of this chapter.

CONCLUSION

In this chapter, I traced the development of the non-Aristotelian paradigm of science in medieval Jewish thought in two areas: astral magic and the doctrine of *segullot*. This development demonstrates that the history of scientific thought should be written in the context of the non-Aristotelian paradigm as well, and not only the Aristotelian. Because the alternative paradigms were sometimes used to explain and defend opposing theological approaches, the history of the relationship between science and theology must be studied from different perspectives.

66 Ibid., pp. 275, 284. See Dov Schwartz, "On Gersonides as a Scientist" (Heb.), *Peʿamim* 54 (1993): 134–5. See later notes. See also A. Ravitzky, *Crescas' Sermon on the Passover and Studies in His Philosophy* (Heb.) (Jerusalem: Israel Academy of Sciences, 1988), index, s.v. *segullah*.

67 *Sefer ha-Ḥinnuḵ*, introduction, ed. C. B. Chavel (Jerusalem: Mosad Ha-Rav Kook, 1974), p. 46: "For who can reveal by speculation the *segullah* of plants and fruit, and the *segullah* of precious stones, and the reason for the motion of iron toward the magnetic stone."

68 *Derašot ha-Ran*, ed. Feldman, p. 10; S. Klein-Braslavy, "Vérité prophétique et vérité philosophique chez Nissim de Gérone," *REJ* 134 (1975): 85–7.

69 See D. J. Lasker, "Joseph Albo's Theory of Verification" (Heb.), *Da'at* 5 (1980): 7–9.

70 "*ʿIggeret ha-Tešuvah* Attributed to R. Isaac Ibn Latif" (Heb.), *Kovetz al yad* 1 (1885): 58.

17

Medicine among Medieval Jews

The Science, the Art, and the Practice

Carmen Caballero-Navas

During the Middle Ages, Jews participated in the medical systems of the Muslim and Christian milieus in which they lived. As a result, the theoretical basis and actual practice of Jewish medicine were largely shaped by the medical traditions of their host societies. This process began around the eighth century, when Jews participated from the very beginning in the translation, transmission, and appropriation of Greek science and philosophy by the Arabs. Arabic language and culture provided the Jews from Persia to the Iberian Peninsula with a common cultural and sociopolitical background that contributed to their cohesion.

With a few exceptions, it was not until the second half of the twelfth century, in the Christian lands of the western Mediterranean, that medical and scientific texts were written in Hebrew. This turning point occurred as part of the encounter between two distinct Jewish cultures, when Jews from al-Andalus who had moved to the northern Iberian Peninsula and the south of France – where the Jewish cultural language was Hebrew – transmitted to their coreligionists the wealth of Greco-Arabic knowledge of which they had been previously unaware.

Soon after, the last decade of the twelfth century witnessed the inauguration of a Hebrew medical corpus – built predominantly on translations – which, growing over the following two centuries, seems to have offered an adequate response to the needs of both Jewish students of medicine and practicing physicians. However, the supremacy of Hebrew as a scientific language did not prevent Western Jews from reading and even writing Arabic (which long maintained its intellectual dominance in the newly re-Christianized territories of the Iberian Peninsula) and, later, Latin and the vernacular.

With regard to the question of practice, notwithstanding the variations in the Jews' living conditions (a result of the diversity of cultural contexts and the extended time period surveyed here), Jews provided health care to their coreligionists as well as to the non-Jewish populations of towns and cities. They also relied on both Muslim and Christian healers for their own medical care.

Although the development of medieval medicine among Jews has received significant attention, especially over the last few years, our picture of this field remains incomplete. This is no surprise if we bear in mind that, in addition to the broad chronological and geographical extent covered, some areas are not documented as well as others, and the production and diffusion of texts – indicators of the acquisition and transmission of medical knowledge – were extremely uneven. In addition, the diversity of cultural contexts (and fluctuating borders), forms of communal organization, legal frameworks, spoken and written languages, and other sociopolitical circumstances, all of which played a part in the development and organization of medicine and in how it was understood by medieval Jews, makes it more difficult to produce a comprehensive account.

The aim of this chapter is to present an overview of the current state of the art to the extent possible in a brief essay. Thus I endeavor to summarize, comprehensibly and coherently, what has been studied and published to date. The chapter has two main foci: (1) the acquisition and transmission of medical knowledge and (2) the practice of medicine in a multicultural context. I treat medicine in Islamic countries and in Christian Europe (the Iberian Peninsula and southern France) separately,[1] because the Jewish cultures were significantly different, although at times they overlapped, in both time and space.

PIONEERS OF MEDICAL WRITING IN HEBREW

In general terms, before the end of the twelfth century, all Jewish medical writing was in Arabic. However, there were two important exceptions: two Hebrew medical books that circulated during the tenth century in southern Italy and preceded the birth of the Hebrew medical corpus by at least two centuries.

The date of composition of the first medical book preserved in Hebrew, *Sefer ʾAsaph* or *Sefer ha-Refuʾot* (Book of Asaph or Book of Medicines), is uncertain, as is the identity of its author, about whom there is no definite evidence, although the book has been attributed to the eponymous Asaph ha-Rofeʾ. Some scholars hold that the book was written in Palestine in the third to fifth centuries; others maintain that it was written only shortly before the sixth or seventh century. Others favor the idea that it is an early medieval compilation. Some have even suggested that it may have been written by Shabbetai Donnolo, a medical author from southern Italy who is credited with having reedited the book in the tenth century.[2]

Sefer ha-Refuʾot is unique, in that it represents a consistent and deliberate attempt to link Greek medicine to talmudic tradition by demonstrating that medicine stems from Jewish culture. The book has four parts, although the extant manuscripts (around twenty) differ in their order and even content: aggadic tradition on the transmission of medical knowledge from God to human beings, a general survey of medicine, a glossary of *materia medica*, and medical aphorisms. In the first section,[3] the author endeavors to prove that the origin of medicine can be traced to the patriarchs. The chain of transmission begins with Noah, who received his healing knowledge from the angel Raphael, wrote it down in the first book of medicine, and handed it to his oldest son, Shem.[4] The author's strategy foreshadows the approach shared by some later translators and intellectuals, including Maimonides, whose

[1] I have not included Central Europe in my overview, because Jews there did not have the same appreciation of science as did their coreligionists in the south, and their cultural life had a different dynamic. I have made some references to Italy, but the distinct circumstances of Italian Jewry deserve an independent study.

[2] Except for the oath (see n. 7) and an extensive excerpt from one manuscript (Cod. Munich 231), the work has never been edited or translated. For a partial transcription and translation, see A. Melzer, "Asaph the Physician – The Man and His Book: A Historical-Philological Study of the Medical Treatise 'The Book of Drugs,'" Ph.D. dissertation, University of Wisconsin, 1972. See also Suessman Muntner, "The Antiquity of Asaph the Physician and His Editorship of the Earliest Hebrew Book of Medicine," *Bulletin for the History of Medicine* 25(2) (1951): 101–31; idem, "The Book of Asaph the Physician," *Koroth* 3 (1965): 396–422 (Heb.); Elinor Lieber, "Asaf's 'Book of Medicine,' a Hebrew Encyclopedia of Greek and Jewish Medicine, Possibly Compiled in Byzantium on an Indian Model," *Dumbarton Oaks Papers* 38 (1984): 233–49; idem, "An Ongoing Mystery: The So-Called Book of Medicine Attributed to Asaf the Sage," *Bulletin of Judeo-Greek Studies* 6 (1991): 18–25; Joseph Shatzmiller, *Jews, Medicine and Medieval Society* (Berkeley: University of California Press, 1994), p. 11 n. 50; Stephen Newmyer, "Asaph the Jew and Greco-Roman Pharmaceutics," in Irene Jacob and Walter Jacob, eds., *The Healing Past: Pharmaceuticals in the Biblical and Rabbinical World* (Leiden: Brill, 1993), pp. 107–20.

[3] This section appears in several extant manuscripts, although at the start of only one of them.

[4] See n. 2 and the Hebrew text in Melzer, "Asaph the Physician," pp. 93–5.

works conveyed the notion that medicine is not alien to Judaism.[5] This approach, aimed at legitimizing Jewish involvement in medicine as well as justifying the lack of original Jewish work in the field, was also employed by Nathan ha-Meʾati in the prologue to his translation of Ibn Sīnā's *Canon*, completed in 1279. There he claimed that the medical knowledge possessed by the Jews in the time of Solomon and later had been lost in exile.[6] In addition, *Sefer ha-Refuʾot* contains the first Hebrew medical oath.[7]

In southern Italy, Shabbetai Donnolo (913–ca. 982) wrote the first Hebrew medical book produced in Christian Europe. Known as *Sefer ha-Yaqar* (Book of the Precious) or *Sefer Mirqaḥot* (Book of Remedies), it is a pharmacopoeia on compound medicines and has been preserved in two manuscripts.[8] Donnolo may also have written an *Antidotarium*, which he himself mentions in the colophon of *Sefer ha-Yaqar*, but it has not yet been identified.[9]

According to the author himself, Donnolo's *Sefer ha-Yaqar* was mainly based on the experience he accumulated in forty years of medical practice. It brings together many remedies (electuaries, potions, powders, poultices, and ointments) that reflect an understanding of health care strongly influenced by Greek medicine. Yet this mass of Greek medical knowledge was not linked to the theoretical and practical body of knowledge reelaborated and disseminated in Arabic, which would not reach the south of Italy until a century later, through the translations by Constantine the African.[10] *Sefer ha-Yaqar* is contemporary with other medical texts produced in Salerno and other parts of Italy before that date and is one of the few works of that age written outside the monasteries – the only institutions that supposedly

5 Norman Roth, "The 'Theft of Philosophy' by the Greeks from the Jews," *Classical Folia* 32 (1978): 53–67. See also Esperanza Alfonso, *Islamic Culture through Jewish Eyes: Al-Andalus from the Tenth to Twelfth Century* (New York: Routledge, 2008), pp. 43–6.

6 See Joshua O. Leibowitz, "The Preface by Nathan ha-Meati to His Hebrew Translation of Avicenna's *Canon* (1279)," *Koroth* 14 (2000): 149–54; first published in Hebrew in *Koroth* 7(1–2) (1976). See also Harry Friedenwald, "Note on the Importance of the Hebrew Language in Medieval Medicine," in *The Jews and Medicine*, 2nd ed. (New York: Ktav, 1967), 1: 181–4; Lola Ferre, "Hebrew Translations from Medical Treatises of Montpellier," *Koroth* 13 (1998–9): 21–36, on p. 27.

7 For a critical edition and English translation, see Elinor Lieber, "The Covenant Which Asaf Son of Berakhyahu and Yohanan Son of Zebda Made with Their Pupils: Text and Translation [Bodl. 2138, Munich 231]," in Joshua Leibowitz, ed., *Memorial Volume in Honor of Prof. S. Muntner* (Jerusalem: Israel Institute of the History of Medicine, 1983), pp. 83–94. See also the translation into English by S. Pines, "The Oath of Asaph the Physician and Yohanan ben Zabda: Its Relation to the Hippocratic Oath and the Doctrina Duarum Viarum of the Didache," *Proceedings of the Israel Academy of Sciences and Humanities* 9 (1975): 223–64. See also Isadore Simon, "Le 'Serment médical' d'Assaph, médecin juif du VII^e^ siècle; avec une étude comparative du 'serment d'Hippocrate,' de la 'Prière médicale' de Maïmonide et du 'Serment de Montpellier,'" in Gad Freudenthal and Samuel Kottek, eds., *Mélanges d'histoire de la médecine hébraïque: études choisies de la* Revue d'histoire de la médecine hébraïque *(1948–1985)* (Leiden: Brill, 2003), pp. 49–58; Samuel S. Kottek, "A Hebrew Paraphrase of the Hippocratic Oath (from a Fifteenth-Century Manuscript)," *Medical History* 22(4) (1978): 438–45; Shimon M. Glick, "A Comparison of the Oaths of Hippocrates and Asaph," *Koroth* 4 (1986): 297–302; repr. in *Koroth* 14 (2000).

8 The book has been edited three times: (1) Moritz Steinschneider, "Donnolo. Pharmakologische Fragmente aus dem X. Jahrhundert, nebst Beiträgen zur Literatur der Salernitaner, hauptsächlich nach handschriftlichen hebräischen Quellen," *Virchow's Archiv für pathologische Anatomie und Physiologie und für klinische Medizin* 38 (1867): 65–91; 39: 296–336; 40: 80–124; 42 (1868): 51–112; (2) Suessman Muntner, *Rabbi Shabbetai Donnolo (913–985)*: First Section: *Medical Works* (Jerusalem: Mossad Harav Kook, 1949) (Heb.); (3) Lola Ferre, "Donnolo's *Sefer ha-Yaqar*. New Edition with English Translation," in G. Lacerenza, ed., *Šabbetay Donnolo. Scienza e cultura ebraica nell'Italia del secolo X* (Naples: Università degli Studi di Napoli "L'Orientale," 2004), pp. 1–20 (this is the only edition that uses both extant manuscripts).

9 See Ferre, "Donnolo's *Sefer ha-Yaqar*," pp. 1–2; for the reference to the *Antidotarium*, see pp. 11 and 19 (Hebrew and translation, respectively). For a general overview of Donnolo's medical production, see Giuliano Tamani, "L'Opera medica di Shabbetay Donnolo," *Medicina nei secoli* 11 (1999): 547–58.

10 See Danielle Jacquart and Françoise Micheau, *La médecine arabe et l'Occident médiéval*, 2nd ed. (Paris: Maisonneuve et Larose, 1996), pp. 118–29.

preserved and copied the classical cultural and scientific heritage.[11] Its composition and circulation bear further witness to Jewish involvement in the actual practice of medicine in tenth-century southern Italy and to the existence of a Jewish audience there for medical literature in Hebrew.

The lack of Hebrew medical, pharmacological, and technical terminology prompted the authors of both books to create the linguistic means for conveying in Hebrew the *materia medica*, medicines, and treatments they recommended. Henceforth interest in the Hebrew language would be intimately linked with the progress of medicine among medieval Jews and would have a strong influence on the work of medical authors, translators, and copyists and on the activity of medical students.

THE MEDICAL KNOWLEDGE OF JEWS IN MUSLIM COUNTRIES: ACQUISITION AND TRANSMISSION

The Greek-to-Arabic translation movement that got underway in the East around the mid-eighth century – which inaugurated an enriching process of transmitting and appropriating Greek science and philosophy in a multicultural context – had a considerable impact on Jewish culture. However, Jews, who had been quick to adopt the Arabic language and cultural model, did not play an important role in this enterprise of translation, although some did collaborate in the diffusion, reelaboration, and adaptation of Greek philosophy and science.[12] We know the names of three Jewish physicians from this period: Māsarjuwayh, his son ʿIsa, and Furat ben Shahnatha.[13]

For practical reasons, medicine, together with astrology, astronomy, and alchemy, was among the disciplines translated in the early stage of the translation movement. The medical works of Hippocrates and Galen and Dioscorides' *Materia medica* constituted the main corpus rendered into Arabic and commented on by diverse authors. Almost all of Galen's vast body of writing had been translated into Arabic by the second half of the ninth century; his medical theories and concepts were conveniently reelaborated in what has been called the "Galenization" of Arabic medicine.[14]

It is difficult to determine patterns in the acquisition and transmission of medical knowledge among Jews in this context. The widespread use of Arabic makes it difficult to ascertain the texts and authors most appreciated by the Jews and to identify the books they owned or used. Nonetheless, manuscripts written in Judeo-Arabic (that is, Arabic in Hebrew characters) and those that contain marginal glosses in Hebrew tell us something about Jewish preferences regarding authors and help us better understand patterns in the diffusion of medical works.[15] In addition, the impressive collection of manuscripts found in the

[11] Ron Barkai, "Jewish Medical Treatises in the Middle Ages," in Natalia Berger, ed., *Jews and Medicine: Religion, Culture, Science* (Philadelphia: Jewish Publication Society, 1995), pp. 45–87, on pp. 49–50.

[12] See Lola Ferre, "Los judíos, transmisores y receptores de la sabiduría medieval," *Revista Española de Filosofía Medieval* 7 (2000): 81–93, on pp. 82–4; Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early ʿAbbāsid Society (2nd–4th/8th–10th Centuries)* (London: Routledge, 1998); Harry Friedenwald, "The Use of Hebrew Language in Medical Literature," *The Jews and Medicine*, pp. 152–5.

[13] See Max Meyerhof, "Medieval Jewish Physicians in the Near East, from Arabic Sources," *Isis* 28 (1938): 432–60, on pp. 435–7 (repr. in Fuat Sezgin, ed. *Mūsā ibn Maymūn (Maimonides) (d. 601/1204): Texts and Studies* [Frankfurt a. M.: Institute for the History of Arabic-Islamic Science, 1996], pp. 140–68).

[14] See Jacquart and Micheau, *La médecine arabe*, pp. 32–44; Gutas, *Greek Thought*, pp. 118–19; M. Abbatouny, J. Renn, and P. Weining, "Transmission as Transformation: The Translation Movements in the Medieval East and West in a Comparative Perspective," *Science in Context* 14 (2001): 1–12, on p. 3.

[15] See Y. Tzvi Langermann, "Arabic Writings in Hebrew Manuscripts: A Preliminary Relisting," *Arabic Sciences and Philosophy* 6 (1996): 137–60; idem, "Transcriptions of Arabic Treatises into the Hebrew Alphabet: An Underappreciated Mode of Transmission," in F. J. Ragep and S. P. Ragep, eds., *Tradition, Transmission, Transformation*

Cairo Geniza, which included hundreds of medical writings (in Arabic, Judeo-Arabic, Hebrew, and even Judeo-Spanish), as well as other documents that contain data related to the medical profession, has contributed valuable information on the Jews' broad interest in medical theories and ideas, the Jewish medical library, and the organization and operation of medical practice.[16]

In contrast, original Jewish works do not seem to have been abundant and are hard to distinguish from the literature produced by contemporary Christian and Muslim writers in Arabic. Nonetheless, it is worth noting that a few Jewish medical authors were acknowledged by their contemporaries. Furthermore, some gained a reputation that transcended their time, and their writings circulated not only in Arabic but also later in Hebrew and in Latin. This is the case of two prominent Jewish physicians and medical authors whose works, after being translated into Hebrew, exerted a considerable impact on Jewish readers and were also esteemed by Christian scholars: Isaac Israeli and Maimonides.

Isaac ben Solomon Israeli (Egypt, ca. 855–Kairouan, ca. 955) was a major figure among his contemporaries. He wrote the earliest known monograph on fevers. The book was greatly appreciated, enjoyed long-lasting popularity, and was profusely quoted by Jewish authors as well as physicians of the Arabic and Latin medical traditions. It was translated into Latin by Constantine the African – who omitted the attribution to Israeli – around 1087, inaugurating (along with several other works) the reception of Arabic medicine in the Latin medical tradition developed at Salerno. In Provence, as early as 1197–9, an unknown translator (to whom we return later) made the first translation into Hebrew from Constantine's Latin version. Some time later, it was translated again into Hebrew, apparently in the same area, by a hitherto unknown translator, but this time from the Arabic original. Isaac Israeli's works were published in Latin and first attributed to him in 1515, under the title *Opera Omnia Isaac*. Works by other Arabic authors, such as Ali Abbas al-Majūsi and Israeli's disciple Ibn al-Jazzār, were also erroneously attributed to him.[17]

Israeli also wrote the *Book of Urine*, *On Simple Remedies and Foodstuffs*, *On Theriac*, and *Sefer ha-Yesodot* (Book of the Elements). That last book combines philosophy and medicine and displays the influence of Aristotle, Hippocrates, and Galen on Israeli's ideas. He also

(Leiden: Brill, 1996), pp. 247–60; Colin Baker, "Judaeo-Arabic Material in the Cambridge Genizah Collection," *Bulletin of the School of Oriental and African Studies* 58 (1995): 445–54.

[16] Paul Fenton, "The Importance of the Cairo Genizah for the History of Medicine," *Medical History* 24 (1980): 347–8; Haskell D. Isaacs, "Medieval Judaeo-Arabic Medicine as Described in the Cairo Geniza," *Journal of the Royal Society of Medicine* 83 (1990): 734–7; Haskell D. Isaacs and Colin Baker, *Medical and Paramedical Manuscripts in the Cambridge Genizah Collections* (Cambridge: Cambridge University Press, 1994); Friedrich Niessen and Efraim Lev, "Addenda to Isaacs' *Medical and Para-Medical Manuscripts in the Cambridge Genizah Collections* Together with the Edition of Two Medical Documents T-S 12.33 and T-S NS 297.56," *Hebrew Union College Annual* 77 (2006): 131–65; Shelomo Dov Goitein, *A Mediterranean Society: The Jewish Community of the Arab World as Portrayed in the Documents of the Cairo Geniza* (Berkeley: University of California Press, 1967–93), 2: 240–72; Efraim Lev, "Work in Progress: The Research of Medical Knowledge in Cairo Genizah – Past, Present and Future," in Stefan Reif, ed., *The Written Word Remains: The Archive and the Achievement* (Cambridge: Taylor-Schechter Genizah Research Unit, 2004), pp. 37–51; Efraim Lev and Zohar Amar, "Medieval Materia Medica – Practica vs. Theory – the Case of the Cairo Genizah," *Medical History* 51 (2007): 507–26.

[17] See Fuat Sezgin, ed. *Isḥāq ibn Sulaymān al-Isrāʾīlī (d. c. 325/935): Texts and Studies* (Frankfurt a. M.: Institute for the History of Arabic-Islamic Science, 1996); J. D. Latham, "Isaac Israeli's ʿKitāb al-Ḥummayāt and the Latin and Castilian Texts," *Journal of Semitic Studies* 14 (1969): 80–95; Danielle Jacquart, "Le place d'Isaac Israeli dans la médecine médiévale," *Vesalius* 4 (1998): 19–27; Raphaella Veit, *Das Buch der Fieber des Isaac Israeli und seine Bedeutung im lateinischen Westen: Ein Beitrag zur Rezeption arabischer Wissenschaft im Abendland* (Stuttgart: Franz Steiner, 2003); Lola Ferre and Raphaela Veit, "The Textual Traditions of Isaac Israeli's *Book on Fevers* in Arabic, Latin, Hebrew, and Spanish," *Aleph* 9(2) (2009): 309–34.

composed a fifty-paragraph treatise on medical ethics, which survives only in its Hebrew translation, *Musar ha-rofeʾim*.[18]

Maimonides (Cordoba, 1138–Fustat, 1204) was the most prestigious physician and medical author – as well as philosopher and exegete – of medieval Jewish cultures. By 1167/8 he had settled in Fustat (Egypt), where, starting around 1177, he made the practice of medicine his main means of livelihood. According to recent research, he composed his medical works from 1191 onward, after he had completed his philosophical, legal, and theological writings. He wrote ten medical books that were, for the most part, short monographs on asthma, hemorrhoids, sexual hygiene and aphrodisiacs, diet, and pharmacology. However, three were major medical works: a commentary on the *Aphorisms* of Hippocrates, a compendium of Galen's work, and his own aphorisms.[19]

Maimonides' heavy reliance on Galen's medical theories, which he knew through the numerous medieval Arabic translations, is noticeable in his writings. In fact, Maimonides himself described his compendium of Galen, still unpublished, as a collection of passages copied verbatim from Galen.[20] Also profoundly Galenic is the commentary on the *Aphorisms* of Hippocrates, where he follows Galen's commentary and adds his own remarks when he finds it necessary. His own *Medical Aphorisms* is an extensive synthesis of contemporary medical knowledge, which is for the most part Galenic and apparently conceived as a *vade mecum* or as a practical tool for teaching. It is divided into twenty-five treatises, the last of which was apparently written some time after the first twenty-four were completed. In addition to its undeniable value for the history of medicine among Jews, the book also has the indisputable merit of contributing to the reconstruction of some of Galen's lost works, because it preserves portions of their early Arabic versions and corrects copyists' mistakes in some extant Arabic and Greek manuscripts. As Gerrit Bos notes in his still incomplete edition of the Arabic original of Maimonides' book, Treatises 7 and 16 embed fragments of two of Galen's works that are not extant in Greek: the *Motibus manifestis et obscuris* and the commentary on Hippocrates' *De mulierum affectibus*.[21]

Though no other Jewish authors attained anywhere near the prestige of these two paramount figures, some of them produced and circulated medical writings in Arabic,

[18] Some scholars have doubted Israeli's authorship, although the work is generally attributed to him. The only edition of the text to date was produced by Kaufmann, who also translated it into German: David Kauffman, "Mūsar hārōfeʾīm" and "Isak Israeli's Propädeutik für Ärzte," *Magazin für die Wissenschaft des Judenthums* 11 (1884): 11–16 and 97–112, respectively. In 1944, Saul Jarcho translated it into English from Kaufmann's edition. See Harry Friedenwald, "Manuscript Copies of the Medical Works of Isaac Israeli," *The Jews and Medicine*, 1: 185–92, on p. 188; Saul Jarcho, "Guide for Physicians (Musar Harofim) by Isaac Judaeus (880?–932?)," *Bulletin of the History of Medicine* 15 (1944): 180–8 (both repr. in Sezgin, *Isḥāq ibn Sulaymān al-Isrāʾīlī*, pp. 123–33 and 134–42, respectively). See also Ariel Bar Sela and Hebbel E. Hoff, "Isaac Israeli's Fifty Admonitions to the Physicians," *Journal of the History of Medicine and Allied Sciences* 17 (1962): 245–57; Alexander Altmann and Samuel M. Stern, *Isaac Israeli, a Neoplatonic Philosopher of the Early Tenth Century* (London: Oxford University Press, 1958).

[19] See Herbert A. Davidson, *Moses Maimonides: The Man and His Works* (Oxford: Oxford University Press, 2005), pp. 28, 32–5, and 429–83; Fuat Sezgin, *Mūsā ibn Maymūn*; Maimonides, *On Asthma: A Parallel Arabic-English Text*, ed., trans., and annot. Gerrit Bos (Provo, UT: Brigham Young University Press, 2002); Maimonides, *Medical Aphorisms, Treatises 1–5: A Parallel Arabic-English Text*, ed., trans., and annot. Gerrit Bos (Provo, UT: Brigham Young University Press, 2004); Maimonides, *Medical Aphorisms, Treatises 6–9*, ed., trans., and annot. Gerrit Bos (Provo, UT: Brigham Young University Press, 2007); Maimonides, *On Poisons and the Protection against Lethal Drugs: A Parallel Arabic-English Edition*, ed., trans., and annot. Gerrit Bos, Latin trans. ed. Michael R. McVaugh (Provo, UT: Brigham Young University Press, 2009). Bos's editions include an extensive and updated bibliography on Maimonides, which includes the previous editions and translations by Muntner and Rosner.

[20] Davidson (*Moses Maimonides*, pp. 436–8) discusses which of Galen's books might have been used by Maimonides and provides references to the work of scholars who have examined the surviving fragments.

[21] See Maimonides, *Medical Aphorisms, Treatises 1–5*, pp. xxi–xxii.

especially in the Iberian Peninsula. The famous grammarian Marwān Ibn Janāḥ (d. 1040, Saragossa) composed a short pharmacological treatise entitled *Kitāb al-talkhīs*, no longer extant; it consisted of an interesting study of the weights and measures used in medicine along with lists of the names of drugs and their synonyms in Arabic, Persian, Syriac, Greek, Berber, and Romance.[22] Ibn Janāḥ and his treatise are mentioned by two Muslim historians: Ṣaʿid al-Andalusī (d. 1079, Toledo) in his *Kitāb ṭabaqāt al-umam,* and Ibn Abī Uṣaybiʿa (d. 1279, Salkhad) in his biography of Arabic physicians *Uyūn al-anbā fī ṭabaqāt al-aṭṭibba.*[23] Moreover, we may infer that the work enjoyed some diffusion from the fact that it was apparently used by Maimonides and by Ibn al-Baytar, the best-known pharmacologist in al-Andalus.

Some seventy years later, in 1106, Ibn Biklārish completed the pharmacological treatise *Kitāb al-Mustaʿīnī,* which listed hundreds of drugs in a tabular format. He included information on the substances' nature and properties, as well as the ways in which they could be used. He also included the names of the drugs in several languages.[24] Ibn Biklārish also wrote a treatise on foodstuffs, *Risālat al-tabyin waʾl-tartil,* in which he explained and classified foodstuffs according to the Galenic notion of the four faculties that operate in every organ.

Arabic continued to be a means for the transmission of medical knowledge among Jews as late as the fifteenth century, even when they lived in territories that were no longer under Islamic rule; its prevalence thus contributed to the social cohesion of the community of Jewish physicians.[25] This was the case with the Jewish communities of Castile, where some regions were newly reconquered by Christians, providing excellent conditions for cross-cultural fertilization. Recent studies have demonstrated that the great majority of the surviving Arabic medical manuscripts in Arabic script that circulated in Christian Castile belonged to or were copied by Jews.[26] This datum is especially relevant for understanding Jewish medical practice in that setting (see the later discussion). However, Jews did not limit themselves to reading and copying Arabic medical writings. They also composed original medical books in that language, underscoring the centrality of Arabic in the Jewish understanding of medicine, even in a Christian environment.

[22] See David Tené, "Ibn Janāḥ, Jonah (Abu al-Walīd Marwān)," *Encyclopaedia Judaica* 8: 1181–6; Felipe Maíllo Salgado, "Los judíos y la ciencia en la Península Ibérica en el medievo," in *Memoria de Sefarad* (Madrid: Sociedad Estatal para la Acción Cultural Exterior, 2002), pp. 279–91, on pp. 284–6; Zohar Amar and Yaron Serri, "Compilation from Jonah Ibn Ğanāḥ's Dictionary of Medical Terms," *Lĕšonénu* 63 (2000/1): 279–91 (Heb.).

[23] See Ṣaʿid al-Andalusī, *Kitāb ṭabaqāt al-umam,* ed. Ḥayyāt Bū ʿAlawān (Beirut: Dar al-Tali'a, 1985); Ṣaʿid al-Andalusī, *Historia de la filosofía y de las ciencias, o Libro de las Categorías de las Naciones [Kitāb ṭabaqāt al-umam],* trans. Eloísa Llavero Ruiz (Madrid: Editorial Trotta, 2000), p. 179; Ṣāʿid al-Andalusī, *Science in the Medieval World: "Book of the Categories of Nations,"* trans. and ed. Semaʿan I. Salem and Alok Kumar (Austin: University of Texas Press, 1991), p. 81; Ibn Abī Uṣaybiʿa, *Uyūn al-anbā fī ṭabaqāt al-aṭṭibba,* ed. August Müller (Cairo: privately printed, 1882–4), 2: 50.

[24] M. Levey and S. Souryal, "The Introduction to the Kitâb al-Mustaʿînî of Ibn Biklārish (fl. 1106)," *Janus* 55 (1968): 134–66; M. Levey, "The Pharmacological Table of Ibn Biklārish," *Journal of the History of Medicine and Allied Sciences* 26 (1971): 413–21; Henry Paul Joseph Rénaud, "Trois études d'histoire de la médecine arabe en Occident: I. Le Mustaʿīnī d'ibn Beklāreš," *Hespéris* 10 (1931): 135–50; repr. in *Texts and Studies on Islamic Medicine* IV (Frankfurt a. M.: Institute for the History of Arabic-Islamic Science, 1997), pp. 9–26; J. Ricordel, "'Al-Mustaʿīnī': Les 'Tables des medicaments simples' d'Isḥāḳ Ibn Biklārish. Edition, traduction française et analyse (des lettres *alif* à *zāy*)," Ph.D. dissertation, Université Paris 7, 2003–4; Zohar Amar and Yaron Serri, "Ibn Biklarish, One of Spain's Eminent Physicians," *Koroth* 15 (2001/2): 79–91 (Heb.); Charles Burnett (ed.), *Ibn Baklarish's Book of Simples: Medical Remedies between Three Faiths in Twelfth-Century Spain* (Oxford: Oxford University Press, 2008).

[25] For an overview of Jewish physicians who wrote medical works in Arabic in the Near East and al-Andalus, see Meyerhof, "Medieval Jewish Physicians."

[26] See Pieter Sj. van Koningsveld, "Andalusian Arabic Manuscripts from Medieval Christian Spain: Some Supplementary Notes," in M. Forster, ed., *Festgabe für Hans-Rudolph Singer* (Frankfurt: Peter Lang, 1991), pp. 811–23; idem, "Andalusian Arabic Manuscripts from Christian Spain: A Comparative, Intercultural, Approach," *Israel Oriental Studies* 12 (1992): 75–110.

Probably the most significant Jewish contribution to medieval Castilian medicine is the *Kitāb al-ṭibb al-qasṭālī al-malūkī* (Book of Royal Castilian Medicine), written by an unknown Jewish doctor from Toledo who apparently served as physician to Ferdinand IV of Castile (reigned 1295–1312).[27] The book, probably written during the first decades of the fourteenth century, is divided into two distinct parts. The first is a discussion of the foundations of medicine and the activity of physicians; the second, in ten chapters, deals with the standard health problems in Castile at the time and the therapeutic and preventive means that the physician should adopt to treat them. The work ends with an appendix containing prescriptions for medical compounds suitable for Castilians.

There were two other important contributions to medicine in Arabic written by Western Jewish physicians: the book on medicinal plants and remedies by Joshua Lorki (Aragon, late fourteenth century), soon translated into Hebrew under the title *Gerem ha-maʿalot*, and a tract on the Black Death by Elias ben Abraham ha-Sephardi, who emigrated to Constantinople after the expulsion of 1492.[28]

THE STUDY AND PRACTICE OF MEDICINE IN ISLAMIC COUNTRIES

Independent of Jews' theoretical contribution to the contemporary medical corpus, many practiced medicine in territories under Islamic rule, both in the East and in the West, providing health care for Jews and non-Jews alike.[29] The number of practitioners does not seem proportional to the relatively small number of medical authors or, more accurately, to the small number of known medical texts authored by Jews. However, this picture is not surprising, given that the number of practicing physicians is generally larger than that of medical writers.

Yet the high position that some Jewish physicians attained, at times in the service of sultans and the aristocracy, and the fact that many Jewish intellectuals earned their living as doctors indicate that the practice of medicine gave Jews prestige and recognition while enhancing their possibilities for social mobility.[30] Some eminent medieval Jews improved their social and political opportunities through their success in medical practice; for example, Ḥasdai Ibn Shaprut in tenth-century Cordoba combined his role of physician with that of a diplomat at the court of Abd al-Raḥman III.[31] His success in curing Sancho I of Leon of dropsy, a task

[27] For an edition and Spanish translation, see Concepción Vázquez de Benito, "El Kitāb al-ṭibb al-qašṭālī al-malūkī (Libro de medicina castellana regia) (c. 1312)," in E. García Sánchez and C. Álvarez de Morales, eds., *Ciencias de la Naturaleza en al-Andalus. Textos y Estudios, VII* (Granada: CSIC, 2004), pp. 11–107; idem, "Medicina castellana regia," in Camilo Álvarez de Morales, ed., *Ciencias de la Naturaleza en al-Andalus. Textos y Estudios, VI* (Granada: CSIC, 2001), pp. 11–91. See also Concepción Vázquez de Benito and Luis García-Ballester, "Los médicos judíos castellanos del siglo XIV y el galenismo árabe," *Asclepio* 42 (1990): 119–48; Luis García-Ballester, "A Marginal Learned Medical World: Jewish, Muslim and Christian Medical Practitioners, and the Use of Arabic Medical Sources in Late Medieval Spain," in Luis García-Ballester et al., eds., *Practical Medicine from Salerno to the Black Death* (Cambridge: Cambridge University Press, 1994), pp. 353–94, on pp. 376–90; Luis García-Ballester, *La búsqueda de la salud. Sanadores y enfermos en la España medieval* (Barcelona: Península, 2001), pp. 454–72.

[28] See Moritz Steinschneider, *Die Hebräischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893), p. 762; Luis Yagüe Ayuso, "El Libro de los Grados. Gerem ha-maʿalot de Yehosuʿah ibn Vives ha-Lorqui. Traducción, estudio y edición crítica," Ph.D. dissertation, Universidad Complutense de Madrid, 2008; Barkai, "Jewish Medical Treatises," pp. 73–4; Ron Barkai, "Los médicos judeo-españoles y la peste negra," in *Luces y sombras de la judería europea (siglos XI–XVII). Actas de los primeros encuentros judaicos de Tudela* (Pamplona: Gobierno de Navarra, 1996), pp. 121–32.

[29] See Goitein, *A Mediterranean Society*, 2: 240–61; Meyerhof, "Medieval Jewish Physicians."

[30] See Goitein, *A Mediterranean Society*, 2: 240–61; Moshe Perlmann, "Notes on the Position of Jewish Physicians in Mediterranean Muslim Countries," *Israel Oriental Studies* 2 (1972): 315–19.

[31] Ángel Sáenz-Badillos and Judith Targarona, *Diccionario de autores judíos (Sefarad. Siglos X–XV)* (Córdoba: El Almendro, 1988), pp. 50–1; Richard Ayoun, "En Espagne musulmane, Hasdaï ibn Chaprout, premier juif à

entrusted to him by the Andalusian caliph himself, is often credited with having improved not only his own standing but also that of the Jewish community overall. Yet Ibn Shaprut was not the only Jewish physician in the service of a Muslim court. Some time later, Meir Ibn Qamniel (eleventh/twelfth centuries, Seville) was invited by the Almoravid ruler Yusuf Ibn Tashufin (1106–43) to his court at Fez, where he met a colleague from Seville, Solomon Ibn al-Muʿallim, also a well-known poet.[32] Ibn Biklārish, too, was a court physician. Indeed, he named and dedicated his treatise on pharmacology, *Kitāb al-Mustaʿīnī*, after the king of Saragossa, Aḥmad II al-Mustaʿin bi-llah, in the hope of entering into his service.[33] For many intellectuals, the practice of medicine provided a means of earning a living and enjoying a respectable social position while enabling them to devote some of their time to other matters. Ibn Janāḥ was first and foremost a grammarian,[34] whereas Maimonides excelled in philosophy, exegesis, law, and theology; his interest in medicine was guided exclusively by the desire for an income.

The art of medicine was learned from books, but it was also acquired through an apprentice relationship that a student established with a particular master – generally a prominent physician – who transmitted to him (and occasionally her) both theoretical and practical knowledge. Prospective physicians were trained under the supervision and guidance of the master. As far as we know, Jews and Muslims enjoyed the benefits of this system without distinction, whether as student or as teacher. To mention a famous example, Isaac Israeli mentored the North African Ibn al-Jazzār, author of the medical encyclopedia, *Zād al-musāfīr wa-qūt al-ḥādir* (Provisions for the Traveler and Nourishment for the Sedentary).[35] Conversely, many Jewish students received their medical education from a Muslim master. Medical students attended patients under the supervision of the master, trying to implement what had been learned from both books and the master's experience. In some cases, they even had the possibility of working in hospitals, where they were able to care for the sick and further their training. Although Jewish patients were rarely found in those hospitals, there are many examples of Jewish practitioners working in them.[36]

Theoretical medical knowledge was primarily based on Hippocrates and, especially, Galen, whose works had been profusely commented on and whose notions had been reelaborated and adapted by Arab medical authors, who also made their own original contributions. Before long, some medical authors – such as al-Rāzī, Ibn Sīnā, Isaac Israeli, al-Zahrāwī, and, later on, Ibn Rushd – attracted the general acknowledgment of their contemporaries, which secured a place for their works in the corpus that circulated at the time. Authors, translators, and copyists favored formats that facilitated learning. Encyclopedias compiled basic contemporary knowledge; many treatises were written in a question-and-answer format to respond to the educational needs of medical students.[37]

As noted earlier, as late as the fifteenth century, the Jews of Castile and, to a lesser degree, the eastern Iberian Peninsula continued to read, copy, and even write about medicine in Arabic. The presence and circulation of Arabic medical texts in Jewish hands are evidence of the vitality of medical practice in those Jewish communities from the thirteenth to fifteenth centuries. By the end of this period, however, most Jews were no longer fluent in Arabic and

jouer un grand rôle dans la vie publique," *Neue Romania* 24 (2001): 25–35; Joshua Holo, "Hasdai ibn Shaprut," in *Los judíos españoles según las fuentes hebreas* (Valencia: Generalitat Valenciana, 2002), pp. 163–9.

32 See Sáenz-Badillos and Targarona, *Diccionario*, pp. 63 and 95; Norman Roth, "Jewish and Muslim Physicians of Ali Ibn Tashufin," *Koroth* 10 (1993/4): 83–91.

33 See n. 24.

34 See n. 22.

35 See Gerrit Bos, *Ibn Al-Jazzār on Sexual Diseases and Their Treatment: A Critical Edition of Zād al-musāfir wa-qūt al-ḥādir (Provisions for the Traveller and Nourishment for the Sedentary)* (London : Kegan Paul, 1997), p. 5.

36 For Jewish medical education in Islamic countries, see Goitein, *A Mediterranean Society*, 2: 240–61.

37 See Ferre, "Hebrew Translations," pp. 30–2.

needed medical literature in languages they could read. Fortunately, by that time, a body of medical knowledge was available in Hebrew and afforded access not only to the knowledge that had been produced in Arabic but also to the more recent knowledge produced and circulated in the new language of science, Latin.

THE EMERGENCE OF THE HEBREW MEDICAL CORPUS

The second half of the twelfth century was a turning point in the way in which Jews accommodated and disseminated science. Jews in the Christian West (northern Spain, southern France, and Italy) began to consider Hebrew to be an appropriate language for scientific discourse. At the very least, it became the language into which scientific and medical works were translated and in which they were copied, commented on, and even composed, although the number of original contributions pales next to the number of translations.

As has been generally accepted since Gad Freudenthal first pointed it out, the Jews of the western Mediterranean were mainly consumers of science; original production there was less abundant.[38] Thus the writing and diffusion of medical literature in Hebrew were intimately connected to translation. A great enterprise of translation took place from the twelfth to fifteenth century. Major and minor medical works were translated into Hebrew from Arabic, Latin, and some vernaculars and made available to all kinds of medical practitioners and literate laypersons with an interest in the matter. The lack of scientific terminology in Hebrew did not frighten translators away; rather, the pioneers among them made a titanic effort to render what was profane knowledge into their sacred language, adapting Hebrew to the new needs. Their first task was, therefore, to create a lexicon of terms and expressions for medicine and pharmacology, which did not yet exist in Hebrew.[39] A clearly practical attitude prompted some authors to elaborate glossaries of terms to facilitate the identification and understanding of medical, pharmacological, and technical terminology in a multilingual context.[40]

Among the main agents in the creation of a Hebrew scientific corpus were those Jews who, forced by political and social circumstances to flee al-Andalus, engaged in translation

[38] See Gad Freudenthal, “Les sciences dans les communautés juives médiévales de Provence: Leur appropriation, leur rôle,” *Revue des études juives* 152 (1993): 29–136. He developed his argument in previous and subsequent publications: “The Place of Science in Medieval Hebrew-Writing Jewish Communities: A Sociological Perspective,” in Lola Ferre, José Ramón Ayaso, and María-José Cano, eds., *La Ciencia en la España Medieval* (Granada: Instituto de Ciencias de la Educación, 1992), pp. 127–44; “Science in the Medieval Jewish Culture of Southern France,” *History of Science* 33 (1995): 23–58; repr. in his *Science in the Medieval Hebrew and Arabic Traditions* (Aldershot: Ashgate Variorum, 2005). Freudenthal argues that Maimonidean philosophy and the social structures that sustained it kept the study of science within strict boundaries, disregarding the pursuit of science per se and assigning it a subordinate value that detracted from the legitimacy of the study of subjects that were irrelevant to metaphysics or had no practical utility.

[39] The author of the *Sefer ha-Refu’ot* and Shabbetai Donnolo had already faced this very linguistic problem and were also compelled to adapt Hebrew to the new scientific requirements; see nn. 2 and 7. On the linguistic undertakings of medical translators, see Ángel Sáenz-Badillos, *A History of the Hebrew Language* (Cambridge: Cambridge University Press, 1993), pp. 251–64; Lola Ferre, “La terminología médica en las versiones hebreas de textos latinos,” *Miscelánea de Estudios Árabes y Hebraicos* 40 (1991): 87–107; Carmen Caballero-Navas, *The Book of Women’s Love and Jewish Medieval Medical Literature on Women: Sefer Ahavat Nashim* (London: Kegan Paul, 2004), p. 16; José Ramón Magdalena and Yom Tov Assis, *Aljamía romance en los documentos hebraiconavarros (siglo XIV)* (Barcelona: Universidad de Barcelona, 1992), pp. 3–17; Shelomo Morag, “Hebrew in Medieval Spain: Aspects of Evolution and Transmission,” *Miscelánea de Estudios Árabes y Hebraicos* 44 (1995): 3–21; Gerrit Bos, “Medical Terminology in the Hebrew Tradition, Shem Tov ben Isaac, *Sefer ha-Shimmush*, Book 30,” *Journal of Semitic Studies* 55(1) (2010): 53–101.

[40] See Gregorio del Olmo and José Ramón Magdalena, “Documento hebreo-catalán de farmacopea medieval,” *Anuario de Filología* 6 (1980): 159–87; José Ramón Magdalena, *Un glosario hebraicoaljamiado trilingüe y doce “aqrabadin” de origen catalán (siglo XV)* (Barcelona: Universidad de Barcelona, 1993); Gerrit Bos and Guido Mensching, “Shem Tov ben Isaac, Glossary of Botanical Terms, Nos. 1–18,” *Jewish Quarterly Review* 92 (2001):

activities that on occasions involved several generations and gave rise to families of translators such as the Tibbonids. Established mainly in Provence, they were instrumental in passing on the Arab medical corpus to Western communities.[41] Surprisingly, however, the first systematic translation of medical texts into Hebrew was made not from Arabic, but from Latin, when an anonymous translator from Provence translated twenty-four medical works, seven theoretical and seventeen practical, between 1197 and 1199. Although Steinschneider described each of these translations, established their date, and emphasized the importance of this translator whom he called "der Anonymus" – Steinschneider also published the translator's prologue[42] – most scholars have been under the erroneous impression that there was no translation from Latin to Hebrew before the mid-thirteenth century. In 1998, Ron Barkai again drew attention to these translations and corroborated Steinschneider's dating, thus highlighting the existence of a second route by which Greco-Arabic medicine penetrated Jewish learned circles.[43]

Scholars have generally supposed that Jews did not see the need to build a Hebrew medical library as long as Arabic granted them access to the medical corpus available at the time. According to this view, the translation process only began when Jews were no longer proficient in Arabic. Although generally true, this argument does not explain why they began to translate also – and first – from Latin. Indeed, Jews in Provence, unlike those of northern Spain, did not know Arabic. In my view, the early date of the initial comprehensive translation project from Latin is connected to medical practice and to medicine as a practical art. Jews who lived in a Christian milieu shared the health care system of their contemporaries, both as patients and as providers. Consequently they needed to make the medical corpus circulating in the West – whose vehicle of transmission was not a spoken language and, therefore, was inaccessible to laypersons and Jews – available to Jewish practitioners. At least, this aim seems to have guided the enterprise of the pioneering translator from Latin into Hebrew, as may be inferred from his prologue, in which he emphasized the need to train Jewish doctors who would provide health care for the Jewish population and thereby eliminate the need for them to consult gentile physicians.[44] In addition, because Jewish physicians, as is discussed later, treated Christian patients, they needed access to Latin medicine and to the texts that disseminated it if they wanted to retain their clientele. Similarly, the need to keep up with contemporary trends in medicine, according to modern scholars, led to the translation of Ibn Sīnā's *Canon* in Italy some decades later.[45]

21–40; idem, "The Literature of Hebrew Medical Synonyms: Romance and Latin Terms and Their Identification," *Aleph* 5 (2005): 169–211; idem, "A 15th-Century Medico-Botanical Synonym List (Ibero-Romance-Arabic) in Hebrew Characters," *Panace@* 7(4) (2006): 261–8.

41 See David Romano, *La ciencia hispanojudía* (Madrid: Mapfre, 1992), pp. 30–7 and 205–23; Lola Ferre, "Aportación de los judíos a la ciencia medieval," in Francisco Muñoz, ed., *La confluencia de culturas en el Mediterráneo* (Granada: Universidad de Granada, 1993), pp. 141–54, on pp. 148–9; Ron Barkai, *A History of Jewish Gynaecological Texts in the Middle Ages* (Leiden: Brill, 1998), pp. 13–14.

42 Steinschneider, *Die Hebräischen Übersetzungen*, pp. 711–14; idem, "Haqdamat ha-maʿatiq bi-ketab yad Paris 1190," *Magazin für die Wissenschaft des Judenthums* 15 (1888): 197 and 6–14 (Hebrew section). I am grateful to Gad Freudenthal, who drew my attention to this edition and kindly sent me a copy.

43 See Barkai, *A History*, pp. 20–34. Recently, Gad Freudenthal has undertaken an analysis of this translator's enterprise, identifying him as a repentant apostate who used the pseudonym Do'eg ha-ʾEdomi. I am grateful to him for sharing with me his findings and for allowing me to draw on his essay prior to publication, " ʿArav and Edom as Cultural Resources for Medieval Judaism: Contrasting Attitudes toward Arabic and Latin Learning in the Midi and in Italy," pp. 123–56 in Carmen Caballero-Navas and Esperanza Alfonso, eds., *Late Medieval Jewish Identities: Iberia and Beyond* (New York: Palgrave Macmillan, 2010), on p. 145. Chapter 2 in this volume is a revised version of that essay.

44 See MS Paris, BNF héb. 1190, f. 44r; Steinschneider, "Haqdamat ha-ma'atiq," p. 8. See also Barkai, *A History*, p. 21; Freudenthal, " ʿArav and Edom."

45 See Chaim Rabin, "The History of the Translation of the *Canon* into Hebrew," *Melilah* 3–4 (1950): 132–42 (Heb.); Shatzmiller, *Jews, Medicine and Medieval Society*, pp. 49–50.

The inventory of works selected by the anonymous translator ("Doʾeg ha-ʾEdomi") includes the *Isagoge Iohanicci ad Tegni Galieni* by Ḥunayn ibn Isḥaq; Galen's *Microtechne*; Hippocrates' *Prognostikon*; the *Liber Pantegni* and *Viaticum peregrinantis*, Constantine the African's translations of the major works by al-Majūsi and Ibn al-Jazzār, respectively; Isaac Israeli's *Book of Urine* and *Book of Fevers*; two works derived from Latin adaptations of Sorano's *Gynecology*; and the first translation into a language other than Latin of two of the three texts on women's health attributed to Trota or Trotula of Salerno, the *Liber de sinthomatibus mulierum* and the *De ornatu mulierum*.[46] Both the selection of titles and the preference for practical works show, on the one hand, a tendency to favor the acquisition of texts for medical education and, on the other, an early appreciation of the method of learning practiced by the Christians.

The thirteenth century also witnessed some translations from Latin. A new Hebrew version of Ibn al-Jazzār's *Zād al-musāfir* was produced, again translated from the eleventh-century Latin version by Constantine the African, the *Viaticum peregrinantis*. The translator, Abraham ben Isaac, entitled it *Ṣedah la-ʾoreḥim*.[47] Around the end of this century, several translations of Gerard of Cremona's Latin versions of Arabic works were added to the Hebrew medical corpus. In Provence, David ben Abraham Caslari (1280–1337) produced a Hebrew version of Galen's *De malatia complexionis diversa*.[48] In Italy, Hillel ben Samuel translated Ali Ibn Ridwān's commentaries on Galen's *Tegni* and Galen's commentaries on the Hippocratic *Aphorisms*. He also translated Bruno de Lombardo's *Chirurgia magna*, originally written in 1252.[49]

By the fourteenth century, the appreciation of the scholastic system crystallized in the translation into Hebrew of works by masters from Montpellier. Six works by Bernard of Gordon (1258–ca. 1320) were rendered into Hebrew. The *Lilium medicinae*, his major work, was translated twice – by Moses ben Samuel in 1360 (Seville) and by Yequtiel ben Solomon of Narbonne in 1387 – and probably once more, although the last work has not yet been identified.[50] In the second half of the fourteenth century, Abraham Abigdor, the first Jew known to have studied at the medical school of Montpellier, translated Gerard de Solo's *De febribus* and Arnold of Villanova's *Medicationis parabolae*. He also translated a brief treatise known as *Practica*, attributed to Johannes of Parma.[51] There are two other Hebrew versions of this treatise, one by Moses Bondia, produced at the end of the fourteenth century, and another, by an anonymous translator, completed in Italy at the end of the fifteenth century.[52]

Nor were books by Greek medical authors overlooked; between 1307 and 1308, Qalonymos ben Qalonymos translated Galen's *De clysteriis* and *De venesectione*.[53] Works by Arabic authors were also translated from Latin, including al-Rāzī's *Kitāb al-Mansūrī* (*Liber ad Almansorem* or *Liber Almansoris*). A translation of the whole work, recently identified, survives in a

[46] See Steinschneider, "Haqdamat ha-ma'atiq," pp. 6–8. Barkai (*A History*, pp. 21–7) reproduces in English the inventory of works listed by the translator in the introduction. In this pioneering work, Barkai identifies a fragmentary Hebrew translation of the *Liber de sinthomatibus mulierum*, which he edits and translates into English (pp. 181–91). Recently, a different version of the same translation, which preserves some excerpts from *De ornatu mulierum*, has been identified. See Carmen Caballero-Navas, "Algunos 'Secretos de mujeres' revelados. El *Šeʾar yašub* y la recepción y transmisión del *Trotula* en hebreo," *Miscelánea de Estudios Árabes y Hebraicos* 55 (2006): 381–425.

[47] See Steinschneider, *Die Hebräischen Übersetzungen*, p. 705; Bos, *Ibn Al-Jazzār*, p. 10.

[48] Steinschneider, *Die Hebräischen Übersetzungen*, p. 653.

[49] Ibid., pp. 734 and 788, respectively.

[50] Lola Ferre, "Las traducciones hebreas de la obra médica de Bernardo de Gordon," *Miscelánea de Estudios Árabes y Hebraicos* 49 (2000): 191–205.

[51] Lola Ferre, *Practica de Johannes de Parma. Un tratado farmacológico en sus versiones hebreas y catalana* (Granada: Universidad de Granada, 2002), pp. 18–19.

[52] Ibid.

[53] See Shatzmiller, *Jews, Medicine and Medieval Society*, pp. 43 and 46–7.

single manuscript, copied in Portugal in 1374. In addition, in the second half of the fourteenth century, Leon Joseph of Carcassonne made an abbreviated translation of the ninth book (*De curatione aegritudinum qui accidunt a capite usque ad pedes*) from the Latin version by Gerard of Cremona, adding Galen's commentaries.[54]

The fourteenth century also saw the first Hebrew translations from vernacular languages. Joseph Bar Judah ha-Sephardi translated Arnold of Villanova's *Regimen sanitatis ad inclytum regem Aragonum* from the Catalan version that Berenguer Sarriera completed between 1305 and 1310. In 1460, Samuel ben David produced a new translation from a different Catalan adaptation. There exists a third Hebrew translation that apparently also derives from a Catalan version.[55] These translations from Catalan do more than merely reveal the well-known competency of Jews in vernacular languages, the vehicle through which they collaborated in the processes of translations from Arabic into Latin, first in Toledo and later in the kingdom of Aragon; they may also be connected to an important phenomenon that took place in the later Middle Ages, when vernacular languages began to be used as a vehicle of science in a deliberate "vernacularization" of learning. Just as Hebrew works were translated into the vernacular, some Catalan and Castilian texts circulated in the Iberian peninsula in Hebrew-letter transcriptions.[56]

The first Hebrew translation of a medical book from Arabic was done in 1199 in Béziers by Samuel Ibn Tibbon, who translated Galen's *Microtechne* with a commentary by Ali ibn Ridwān.[57] Translations from Arabic proliferated during the thirteenth century. For example, Ibn Sīnā's *Arjūza*, a poem summarizing the fundamental medical knowledge of his time, was translated into Hebrew at least four times, beginning with the version plus commentary by Solomon ben David in 1233.[58] Around midcentury, Solomon Ibn Ayyūb, a physician from Granada established in Béziers, produced a new translation of the *Arjūza*.[59] Moshe Ibn Tibbon, a physician and prolific translator, also translated the *Arjūza* together with Ibn Rushd's commentary in 1260; in 1250 he had translated a compendium of Ibn Rushd's commentaries on some of Aristotle's works.[60] Some years earlier still, in 1244, he had translated Maimonides' *Regimen sanitatis* under the title *Maʾamar be-hanhagat ha-beriʾut;* later he would

[54] See Y. Tzvi Langermann, "Some New Medical Manuscripts from St. Petersburg," *Koroth* 13 (1998–9): 9–20, on pp. 14–15; Lutz Richter-Bernburg, "Abū Bakr Muḥammad ibn Zakarīyā al-Rāzī's (Rhazes) Medical Works," *Medicina nei secoli,* 6 (1994): 377–92; and Luis García-Ballester, Lola Ferre, and Eduard Feliu, "Jewish Appreciation of Fourteenth-Century Scholastic Medicine," *Osiris* (2nd series) 6 (1990): 85–117, on pp. 107–17.

[55] Lola Ferre, "Los regímenes dietéticos medievales en prosa y en verso: entre la medicina y la literatura," *Espacio, Tiempo y Forma,* Serie III, *Historia Medieval* 7 (1994): 327–40, on pp. 328–9; Lluís Cifuentes, "Vernacularization as an Intellectual and Social Bridge: The Catalan Translations of Teodorico's *Chirurgia* and of Arnau de Vilanova's *Regimen Sanitatis,*" *Early Science and Medicine* 4(2) (1991): 127–48, on p. 132; Joseph Ziegler, "Religion and Medicine: On the Adaptation of Latin and Vernacular Texts to Hebrew Readership," *Würzbunger medizinhistorische Mitteilungen* 18 (1999): 149–58, on pp. 152–3.

[56] For example, the *Surgery* of Lanfranco of Milan. See Lluís Cifuentes, "Las traducciones catalanas y castellanas de la 'Chirurgia magna' de Lanfranco de Milán: un ejemplo de intercomunicación cultural y científica a finales de la Edad Media," in T. Martínez Romero and R. Recio, eds., *Essays on Medieval Translation in the Iberian Peninsula* (Omaha, NE: Creighton University and Castelló de la Plana: Universitat Jaume I, 2001), pp. 95–127. Jewish access to Romance works is also evidenced by the glosses in Hebrew found in some works, such as a Catalan copy of the *Surgery* of Teodorico Borgognoni, produced in Majorca in 1310–11. See García-Ballester, Ferre, and Feliu, "Jewish Appreciation," pp. 89–90; Lluís Cifuentes, "Vernacularization as an Intellectual and Social Bridge," p. 129. Regarding translations into Hebrew from the vernacular, one of the translations of Bernard of Gordon's *Lilium medicinae* may have been made from the vernacular. See Ferre, "Hebrew Translations," p. 36.

[57] See Steinschneider, *Die Hebräischen Übersetzungen*, p. 471.

[58] See Langermann, "Some New Medical Manuscripts," pp. 13–14.

[59] Steinschneider, *Die Hebräischen Übersetzungen*, p. 700.

[60] Ibid., pp. 699 and 109, respectively.

translate Maimonides' commentary on the *Aphorisms* of Hippocrates and *On Poisons*.[61] We also owe to him the only translation from Arabic of Ibn al-Jazzār's *Zād al-musāfir*, made in 1259 under the title *Ṣedat ha-deraḵim*.[62] Moshe Ibn Tibbon's contemporary, Shem Ṭov ben Yiṣḥaq Tortosi translated al-Zahrāwī's *Kitāb al-tasrīf li-man ajiza an al-talif* (The Recourse of Him Who Cannot Compose [a Medical Work of His Own]) as *Sefer ha-Šimmuš,* between 1254 and 1262, and al-Rāzī's *Kitāb al-Mansūrī* in 1264.[63]

Jewish translators from Arabic also worked in Italy, where Nathan ha-Meʾati and Zeraḥiah ben Yiṣḥaq Ḥen carried out their outstanding labors. The former translated medical texts exclusively, contributing many Greek works to the Hebrew medical library, such as an epitome of Galen's commentary on the Hippocratic *On Airs, Waters, and Places*.[64] However, he is best known for having produced the first and only complete Hebrew translation of Ibn Sīnā's *Canon*, completed in 1279.[65] At around the same time and place, Zeraḥiah Ḥen translated the first two books of the same work. Even though he did not complete his version – he stopped when he found out about ha-Meʾati's translation – it seems to have enjoyed more success than the other. He also translated Maimonides' short treatise on coitus, *Maʾamar ha-mišgal,* Galen's *De causis et syntomatibus,* and part of the *Katagene*.[66] Interestingly, both men also translated Maimonides' *Medical Aphorisms*, Zeraḥiah Ḥen in 1277 and Nathan ha-Meʾati between 1279 and 1283. Zeraḥiah's version seems to have circulated among Italian Jews, whereas Ha-Meʾati's was most appreciated in Spain and southern France.[67]

Ibn Sīnā's *Canon* was partially translated once more from Arabic in the fourteenth century by Joseph ben Joshua Ibn Vives Lorki, who translated the first book and two *fens* of the second. This version circulated widely, as witnessed by the existence of more than thirty manuscripts.[68]

This succinct overview of the corpus of medical works translated into Hebrew reveals that Jewish intellectual interest gradually shifted toward the Latin cultural model. It also

[61] The first text has been edited by Suessman Muntner (Maimonides, *Peruš le-firqei Abuqrat* [Jerusalem: Mossad Harav Kook, 1961]) and translated into English by Fred Rosner (*Maimonides' Commentary on the Aphorisms of Hippocrates* [Haifa: Maimonides Research Institute, 1987]). His translation of *On Poisons,* too, was edited by Muntner (*Sammei ha-mavet ve-ha-refuʾot ke-negdam* [Jerusalem, 1942]) and has been translated into several modern languages. See Maimonides, *Medical Aphorisms, Treatises 1–5,* p. xx n. 9. Recently, Gerrit Bos has completed a parallel Arabic-English edition of this work, together with editions from medieval Hebrew translations, as well as of medieval Latin translations by Michael McVaugh. See Maimonides, *On Poisons and the Protection against Lethal Drugs.*

[62] Steinschneider, *Die Hebräischen Übersetzungen*, pp. 703–4; Bos, *Ibn al-Jazzār,* p. 10.

[63] See Eduard Feliu, "El próleg de Semtov ben Issac, 'el Tortosí,' a la seva traducció hebrea del 'Tasrif' d'Abu-l-Qasim al-Zahrawi," *Tamid* 3 (2000–1): 65–95; Bos and Mensching, "Shem Tov ben Isaac"; Richter-Bernburg, "Abū Bakr Muhammad."

[64] Steinschneider, *Die Hebräischen Übersetzungen*, p. 662; *Galen's Commentary on the Hippocratic Treatise* Airs, Waters, Places *in the Hebrew Translation of Solomon ha-Meʾati,* ed. and trans. Abraham Wasserstein (Jerusalem: Israel Academy of Sciences and Humanities, 1982).

[65] See Benjamin Richler, "Manuscripts of Avicenna's *Kanon* in Hebrew Translation: A Revised and Up-to-Date List," *Koroth* 8(3–4) (1982): 145–68; published in Hebrew in *Koroth* 14 (2000); Giuliano Tamani, *Il Canon medicinae di Avicenna nella tradizione ebraica. Le miniature del manoscritto 2197 della Biblioteca Universitaria di Bologna* (Padua: Studio Editoriale Programma, 1988); Lola Ferre, "Tracing the Influence of the Hebraic *Canon,*" in Avicena, *Canon medicinae: estudio y edición facsímil del ms. 2197 de la Biblioteca Universitaria de Bolonia* (Madrid: Ars Magna Editorial, 2002), pp. 244–77, on pp. 270–6 (English on even pages).

[66] Tamani, *Il Canon,* p. 61; Ferre, "Tracing the Influence," pp. 276–8; Steinschneider, *Die Hebräischen Übersetzungen,* p. 652.

[67] See Benjamin Richler, "Manuscripts of Moses ben Maimon's Pirke Moshe in Hebrew Translation," *Koroth* 9(3–4) (1986): 345–56; Mauro Zonta, "Review of Maimonides: *Medical Aphorisms, Treatises 1–5*: A Parallel Arabic-English Edition, Edited, Translated, and Annotated by Gerrit Bos," *Aestimatio* 2 (2005): 1–6, on p. 4.

[68] See Richler, "Manuscripts of Avicenna's *Kanon*"; Tamani, *Il Canon,* p. 61; Ferre, "Tracing the Influence," pp. 276–8.

suggests a practical dimension to the selection of translated books: In general, they were intended to provide a medical education and to be used during both training and practice. In addition to curricular requirements, the translators' personal choice played a part in shaping the Hebrew medical corpus. For example, they often insisted on using the style of the pioneering anonymous translator of 1197–9 and on the need to provide Jewish physicians with the texts they needed to practice their profession and for Jews to have well-trained Jewish physicians.[69] Factors of a very different kind, such as the availability of original texts, also had some bearing on the content of the medical library. The periodic prohibitions on selling books to Jews (together with other restrictive regulations and expulsions) made it considerably more difficult to acquire the necessary sources to continue the task of building the Hebrew medical library.[70]

Although the volume of original work was much smaller than that of translations, original medical texts, especially practical treatises and encyclopedias, were composed. The majority remain unedited or have never been translated into a modern language. However, recent studies demonstrate that some texts were well regarded by the contemporaries among whom they circulated. The first to be cited here is an anonymous treatise in two parts, devoted to the diseases of the male and female genitalia, respectively, and known as *Zik̲ron ha-ḥolayim ha-howim bi-k̲lei ha-herayon* (A Record of the Diseases Occurring in the Genital Organs). Probably written in Christian Castile in the latter half of the twelfth or early thirteenth century, this treatise seems to be related to the chapters on male and female sexual diseases in two major medical works written in Castile, in Arabic and Romance, both of which could (according to Barkai) be its source.[71] However, analysis of its section on women's conditions reveals a strong correspondence between the etiology and therapeutics conveyed in it and those articulated in *Fann* XXI of Book III of Ibn Sīnā's *Canon*.[72] Both the similarities between these works and the noticeable influence of Arabic on the Hebrew in which the *Zik̲ron* is written suggest that the anonymous Jewish author may have had access to the *Canon* in Arabic and drew directly from it.

At the end of the thirteenth century, Nathan ben Joel Falaquera wrote a detailed and systematic medical encyclopedia entitled *Ṣori ha-guf* (Balm for the Body). The work is divided into four parts: theory, the practice and regimen of health, a description and treatment of diseases, and a treatise on medicaments, their properties, and curative effects.[73] Some scholars have identified the author as Nathan of Montpellier, who was the teacher of the otherwise unknown author of the *Sefer ha-Yošer,* a comprehensive encyclopedia of contemporary medical knowledge written in Provence in the last decades of the thirteenth century by a

69 These are the reasons alleged by Leon Joseph of Carcassonne in the prologue to his translation of Gerard of Cremona's Latin translation of *Liber ad Almansorem.* See García-Ballester, Ferre, and Feliu, "Jewish Appreciation," pp. 107–17. It is worth noting that many translators of medical texts were physicians themselves.

70 See Shatzmiller, *Jews, Medicine and Medieval Society,* p. 31; idem, "Livres médicaux et éducation médicale: À propos d'un contrat de Marseille en 1316," *Medieval Studies* 42 (1980): 463–70. See also the previously mentioned prologue by Leon Joseph of Carcassonne in García-Ballester, Ferre, and Feliu, "Jewish Appreciation," pp. 112–13.

71 See Barkai, *A History,* pp. 69–76 and 109–44, for the text and English translation. See also Concepción Vázquez de Benito and María Teresa Herrera, "Dos capítulos ginecológicos: árabe y castellano," *Asclepio* 33 (1981): 183–241. For an overview of Hebrew literature on women's health care, see Caballero-Navas, *The Book of Women's Love,* pp. 83–90; idem, "Mujeres, cuerpos y literatura médica en hebreo," *Asclepio* 60 (2008): 37–61, on p. 44, n. 23.

72 See Carmen Caballero-Navas, "Maimonides' Contribution to Women's Health Care and His Influence on the Hebrew Gynaecological Corpus," in Carlos Fraenkel, ed., *Traditions of Maimonideanism* (Leiden: Brill, 2009), pp. 33–50, especially pp. 46–7 and nn. 32 and 63–4.

73 Gerrit Bos and Resianne Fontaine, "Medico-philosophical Controversies in Nathan b. Yo'el Falaquera's *Sefer Ṣori ha-Guf,*" *Jewish Quarterly Review* 90 (1999): 27–60. The fourth part has been recently edited by Zohar Amar and Yael Buchman: Nathan Joel Falaquera, *Ṣori ha-guf* (Ramat-Gan: Bar Ilan University, 2004).

learned physician with clinical experience.[74] The last of the Hebrew works to be mentioned here is *Sefer ʾOraḥ ḥayyim*, written by Moses Narboni in the mid-fourteenth century.[75]

There is no definitive estimate of the number of works translated into or written in Hebrew or the number of medical manuscripts produced, although it seems that there were many.[76]

STUDYING MEDICINE IN A CHRISTIAN MILIEU

"A man should teach his son the Torah, [but also] he should teach him a craft" (B Qiddushin 32b). For the pseudonymous Doʾeg ha-ʾEdomi, the translator who began the introduction of Latin works into the Hebrew medical library, this talmudic saying was the central justification for his translation enterprise.[77] Shem Ṭov Ibn Falaquera (1224–90), in his *Sefer ha-Mevaqqeš* (Book of the Seeker), uses a similar line of reasoning: "I, too, have heard that the sages enjoin one to learn a wholesome occupation which can serve as protection against the vagaries of fate"; he adds that "wise men have stated that the practice of medicine is superior to all other occupations, for it is both a profession and science and is closest to the science of nature."[78]

Medicine was thus a means of earning a living, a respectable craft close to the foundations of science; it was learned mainly from books, generally under the guidance of a master who transmitted his learning, expertise, and medical skills to Jewish medical students. Therefore, teaching and, associated with it, the choice of books and the timing of translations were intimately linked to contemporary trends in medicine – but also and above all to the social and legal circumstances that regulated medical practice. From the thirteenth century onward, the practice of medicine was regulated by licensing. Aspiring medical practitioners in southern Europe needed a *licentia practicandi et curandi*, which generally had to be acquired through examination. In part, the licensing system was implemented to make it possible to fill the social need for medical care, by granting a vast network of practitioners, especially non-Christians and women (whatever their religion) who had no access to university or the right to practice medicine legally.[79]

Whatever the rationale behind the implementation of the licensing system, the choice of medical texts was conditioned on the books and theoretical knowledge required by authorities or the examining board for licensing.[80] Unfortunately, very few documents that record the award of a license to a Jew offer any information as to the scholarly requirements satisfied by the candidate, although we may suppose that they depended to some extent on the type of license applied for. Joseph Shatzmiller has described an interesting document that records the examination of Benedit Caravida, granted a license in Aragon in 1382, who had to answer questions not only on medicine but also on astrology.[81]

Medical astrology is a distinct and significant topic that dates to antiquity. Around the period under discussion, some Jewish authors and medical practitioners believed, as did

74 *Sefer ha-Yošer* has been preserved in six manuscripts, of which two are fragmentary. See Steinschneider, *Die Hebräischen Übersetzungen*, p. 842. I am currently working on an edition and translation of this work.

75 Gerrit Bos, "R. Moshe Narboni: Philosopher and Physician, a Critical Analysis of *Sefer Oraḥ Ḥayyim*," *Medieval Encounters* 1 (1995): 219–51.

76 See Friedenwald, "Note on the Importance," pp. 181–4; Ferre, "Hebrew Translations," pp. 22–3.

77 MS Paris, BNF héb. 1190, ff. 45v–46r; Steinschneider, "Haqdamat ha-maʿatiq," p. 8; Barkai, *A History*, p. 21.

78 See Shem Ṭov Ibn Falaquera, *Sefer ha-Mevaqqeš* (The Hague, 1779), p. 31; idem, *The Book of the Seeker (Sefer ha-Mebaqqesh)*, trans. and ed. M. Herschel Levine (New York: Yeshiva University Press, 1976), p. 39. I am indebted to Aurora Salvatierra, who called my attention to the medical contents of Falaquera's book.

79 See Luis García-Ballester, Michael McVaugh, and Antonio Rubio Vela, *Medical Licensing and Learning in Fourteenth-Century Valencia* (Philadelphia: American Philosophical Society, 1989).

80 See Joseph Shatzmiller, "On Becoming a Jewish Doctor in the High Middle Ages," *Sefarad* 43 (1983): 239–50; idem, *Jews, Medicine and Medieval Society* pp. 14–55.

81 See Shatzmiller, "On Becoming a Jewish Doctor," p. 242.

their Christian colleagues, that the planets had an effect on people's health and on both the prevention and treatment of disease.[82] The Catalan rabbi Solomon ben Adret (ca. 1235–1310) recorded in his *Responsa* that his teacher, the famous Naḥmanides (1194–ca. 1270), made use of an astrologic talisman – a sort of medal with the image of a lion engraved in it – to treat kidney conditions. This piece of information is part of a wider discussion in his correspondence with Abba Mari of Lunel, who condemned these medals as idolatry (see Chapter 16).[83] The recourse to this procedure, which was based on the influence of the zodiacal signs on bodily organs and limbs,[84] was widespread among Christian physicians with strong links to the medical school of Montpellier, such as Arnold of Villanova, who is known to have used this practice on some occasions.[85] Joseph Shatzmiller has demonstrated that on this issue there was a fluid intellectual exchange between Jewish and Christian physicians. He discusses a certain *Book of Figures* (not extant) mentioned by Abba Mari and compares its supposed contents with Arnold of Villanova's *Sigilla magistri Arnaldi* (or *De sigillis*), Bernard of Gordon's *Tractatus magistri Bernardi di Gordonio ad faciendum sigilla et ymagines contra infirmitates diversas*, and an anonymous Hebrew treatise, *The Figures of the Twelve Constellations*, which provides instructions for making zodiacal medallions and their practical application to treat different ailments.[86] He concludes that in this sphere of health care, as in others, some degree of collaboration with Christian masters existed, especially around medical schools like that at Montpellier. Shatzmiller's findings are significant for the understanding of the ways in which Jews received and integrated contemporary learned medical trends, given that no Jew seems to have attended university before 1348, and only a few – in a very limited and brief way – seem to have attended the University of Montpellier in the second half of the fourteenth century.[87]

Supplementing the scarce information that the licensing process records provide on Jewish medical education, other sources contribute further evidence. The previously mentioned philosopher and physician Shem Ṭov Ibn Falaquera, in his *Sefer ha-Mevaqqeš*, presented, through a dialogue between "the Seeker" and a prominent physician, a list of authors of medical books on which "one who wishes to learn the teachings of learned doctors and be of their number can properly rely." The list, unsurprisingly, includes Hippocrates, Galen, Ḥunayn Ibn

[82] Medical astrology should not be confounded with astral magic. The former was considered a science during the Late Middle Ages and developed in learned medical and university circles. The use and impact of astrology in medicine have recently been the object of academic study. See Anna Akasoy, Charles Burnett, and Ronit Yoeli-Tlalim, eds., *Astrology-Medicine: Astrology and Medicine, East and West* (Florence: Sismel–Edizioni del Galluzzo, 2008); *Hebrew Medical Astrology: David ben Yom Tov, Kelal Qatan.* Original Hebrew Text, Medieval Latin Translation, Modern English Translation by Gerrit Bos, Charles Burnett, and Y. Tzvi Langermann (Philadelphia: American Philosophical Society, 2005).

[83] Solomon ben Adret, *Še'elot u-tešuvot ha-Rašba' (Responsa)* (Bene Beraq, 1982), Vol. 1: No. 167 (p. 61) and No. 825 (p. 280). See Joseph Shatzmiller, "In Search of the 'Book of Figures': Medicine and Astrology in Montpellier at the Turn of the Fourteenth Century," *AJS Review* 7–8 (1982/3): 383–407, on pp. 383–4; Samuel Kottek, "Medical Practice and Jewish Law: *Sefer Torat HaAdam,*" in Samuel Kottek and Luis García-Ballester, eds., *Medicine and Medical Ethics in Medieval and Early Modern Spain* (Jerusalem: Magnes Press, 1996), pp. 163–72, on p. 165.

[84] The association of bodily organs and zodiacal signs, known as *melothesia*, goes back to at least the first century C.E. See Alejandro García Avilés, "El cuerpo y los astros: Arte, astrología y medicina en la Edad Media," *Studium Medievale* 1 (2008): 87–99; O. Ricoux, "Homo astrologicus: la mélothésie chez les astronomes latins," in P. Moureau, ed., *Corps romains* (Grenoble: Jérôme Millon, 2002), pp. 201–23.

[85] See Shatzmiller, "In Search," p. 389.

[86] Ibid., pp. 391–404.

[87] Ibid.; Shatzmiller, "On Becoming a Jewish Doctor," p. 254; Joseph Shatzmiller, "Contacts et échanges entre savants juifs et chrétiens de Montpellier vers 1300," *Cahiers de Fanjeaux* 12 (1977): 337–44; Ferre, "Hebrew Translations"; Michael McVaugh and Lola Ferre, *The Tabula Antidotarii of Armengaud Blaise and Its Hebrew Translation* (Philadelphia: American Philosophical Society, 2000), pp. 1–14.

Yisḥaq, al-Rāzī, Isaac Israeli, al-Zahrāwī, Ibn Rushd, and Maimonides.[88] Some decades later, the unknown author of the *Kitāb al-ṭibb al-qasṭālī al-malūkī* also offers a list of medical authors and texts that circulated in Arabic and were supposed to provide Castilian Jewish physicians with theoretical and practical medical knowledge. The list comprises several works by Galen, al-Rāzī's *al-Ḥawī*, Ibn Sīnā's *Canon*, al-Zahrāwī's *Taṣrif*, and al-Majūsi's *Kamil al-Sina'a*.[89]

The diffusion of manuscripts and date of translations may also serve as a source for determining trends in medical education and in textual requirements for licensing. This information may be especially relevant because, as discussed earlier, the corpus of medical translations was shaped by practical needs linked to training medical practitioners. One example is provided by the Hebrew versions of Ibn Sīnā's *Canon*, the most copied book in the history of Jewish medicine: It is extant in 105 copies. Most remarkably, its first translations (around 1280) coincide, as mentioned earlier, with the date at which universities developed an interest in it (although it had been translated into Latin nearly a hundred years before).[90] Other medical works in Hebrew translations also seem to have enjoyed great popularity. That of Bernard of Gordon's *Lilium medicinae* has been preserved in thirty manuscripts[91] and that of Ḥunayn ibn Yisḥaq's *Isagoge* in thirty-seven, of which seventeen are the translation from Arabic and the rest from Latin.[92] Although the vicissitudes of textual transmission have significantly modified the number and distribution of extant copies of any given work, we may safely assert that books that survive in many copies must have been in demand to some extent.

PROVIDING HEALTH CARE WITHIN AND OUTSIDE THE JEWISH COMMUNITIES

As was the case with their coreligionists in Islamic countries, Jewish practitioners in southern Europe were perfectly integrated into the health systems that functioned throughout the Late Middle Ages. They provided health care for the general population and were even hired by Christian authorities to assist the inhabitants of certain towns.[93] Some studies reveal that the number of Jewish physicians in any Jewish community was usually very high, at least in certain areas of Aragon and southern France. In some places there was a disproportionately high number of Jewish physicians in relation to the number of Jews in the population.[94]

[88] See Falaquera, *Sefer ha-Mevaqqeš*, p. 36; Levine, *The Book of the Seeker*, pp. 47–8.

[89] See Vázquez de Benito, "El Kitāb al-ṭibb al-qašṭālī al-malūkī," p. 42 (f. 7r); idem, "Medicina castellana regia," p. 25.

[90] See n. 45.

[91] See Ferre, "Las traducciones hebreas."

[92] See Lola Ferre, "The Medical Work of Ḥunayn ben Isḥaq (Johannitius) in Hebrew Translation," *Koroth* 11 (1995): 42–53.

[93] See Joseph Shatzmiller, "Médecins municipaux en Provence, Catalogne et autres régions de l'Europe méridionale (1350–1400)," in *Les Sociétés urbaines en France méridionale et en Péninsule Ibérique au Moyen Age* (Paris: CNRS, 1991), pp. 329–36. For Castile, see Vázquez and García-Ballester, "Los médicos judíos castellanos," p. 125.

[94] See Shatzmiller, *Jews, Medicine and Medieval Society*, pp. 104–12; Michael McVaugh, *Medicine before the Plague: Practitioners and Their Patients in the Crown of Aragon*, 1285–1345 (Cambridge: Cambridge University Press, 1993), pp. 52–5; García-Ballester, "A Marginal World," pp. 367–8. For additional bibliography on Jewish practitioners, see Isaac Alteras, "Jewish Physicians in Southern France during the 13th and 14th Centuries," *Jewish Quarterly Review* 68 (1978): 209–23; Richard Emery, "Jewish Physicians in Medieval Perpignan," *Michael* 12 (1991): 113–34; Danielle Iancu-Agou, "Les médecins juifs en Provence au XV^{e} siècle; praticiens, notables et lettrés," *Yod* 26 (1989): 33–44; idem, "Médecins juifs et néophytes en Provence (1460–1525)," *Vesalius* (special issue) (1998): 28–36; Josef Rapoport, "Los médicos judíos y su actividad en el reino de Navarra, 1349–1425," *Principe de Viana* 229 (2003): 333–51; Antonio Contreras Mas, *Los médicos judíos en la Mallorca bajomedieval, siglos XIV–XV* (Mallorca: Miquel Font, 1997); J. Hinojosa, "Médicos judíos en la ciudad de Valencia durante la baja Edad Media (siglos XIII y XIV)," in *Estudos em Homenagem ao professor doutor José Marques* (Oporto: Facultade de Letras, 2006), 4 vols., pp. 2:415–37.

A preliminary estimate by García-Ballester shows that, in the second half of the fourteenth century (just before 1391) in northeastern Spain (Catalonia, Aragon, Valencia, and Majorca), between 20 and 30 percent of the medical and surgical practitioners who cared for the Christian population were Jews.[95] Medical practice was, on the whole, itinerant for both Jewish physicians and their non-Jewish colleagues; their geographical mobility often depended on whether or where their services were hired. However, as the fourteenth century advanced, the enactment of anti-Jewish regulations and the general worsening of living conditions for Jews made itinerancy the norm for Jewish practitioners.

As discussed earlier, during the thirteenth century, there was a gradually successful attempt to regulate medical practice through the implementation of a system of licensing. Yet this was not the only possible kind of healing relationship at the time; there were also healing practices whose agents were not directly controlled by any institution. Nonetheless, Jews who wished to practice among Christians were compelled to obtain a license, whereas those who confined their medical attention to their coreligionists were not. When a Jewish woman was accused of practicing without a license and appealed to the king, he ruled that she did not need one because she provided health care only within the Jewish community.[96]

The 1329 *furs* (a legislative act ratified by the king) of Valencia detailed the licensing process according to which only those who had followed the art of medicine for four years in a *Studium generale* had the right to take an examination, with their proficiency assessed by two leading physicians. In theory, this criterion excluded Jews, who were barred from the university. Available data contradict this supposition: A survey of twenty-eight fourteenth-century licensing documents indicates that seven Jewish physicians (and one Muslim barber) were granted licenses.[97] These documents also reveal that just as Christians were obliged to swear an oath, prescribed by the *furs,* "on the four holy Gospels of our Lord God," by which they vowed to "engage well and loyally in the said art," Jews had to swear to behave in the same fashion, but in their case "on the Ten Commandments of the Law that our God gave to Moses on Mount Sinai." These documents include a similar oath, based on their faith, for Muslims. Later, the *fueros* of Monzón of 1363 record explicitly that Jews and Muslims should be examined by a knowledgeable physician of their religion, along with a Christian doctor, unless there were no physicians available from the minority groups, in which case the board would consist of two Christian experts.[98] Licenses were also granted to illiterate practitioners, but they allowed the practitioner to perform only specific sorts of cures and practical remedies.[99] The documents are not very explicit about the language in which the examinations were conducted, although it seems plausible that it was mainly the vernacular, because apparently at least one member of the board was Christian, and not all the candidates (even Christians) were fluent in Latin.[100]

Yet, a considerable number of healers never passed any test, although that did not necessarily mean that they had not undergone training. Unlicensed practitioners often acquired their knowledge, skills, and training from a more experienced and knowledgeable healer who transmitted his or her expertise and wisdom to them. As a general rule, their practice

95 See Luis García-Ballester, "Ethical Problems in the Relationship between Doctors and Patients in Fourteenth-Century Spain: On Christian and Jewish Practitioners," in Kottek and García-Ballester, *Medicine and Medical Ethics*, pp. 11–32, on p. 31; Shatzmiller, *Jews, Medicine and Medieval Society,* pp. 112–18.

96 See Etienne Lepicard, "Medical Licensing and Practice," in Kottek and García-Ballester, *Medicine and Medical Ethics,* pp. 50–60, on p. 59; García-Ballester, McVaugh, and Rubio Vela, *Medical Licensing,* p. 28.

97 García-Ballester, McVaugh, and Rubio Vela, *Medical Licensing,* p. 40.

98 Ibid., pp. 25–9.

99 See Shatzmiller, "On Becoming a Jewish Doctor," p. 244.

100 See Shatzmiller, *Jews, Medicine and Medieval Society,* p. 38.

was validated through social acceptance and recognition. More often than not, nonlicensing was the condition of female medical practice, because women, as noted earlier, were banned from the university, whatever their religion and social status.[101] However, some Jewish and non-Jewish women did hold licenses, which they apparently acquired through the same procedure as men. They were probably trained in the same fashion discussed earlier with regard to the medical education of Jewish students. In fact, they could also mentor prospective physicians – both male and female – and provide them with the knowledge and skills needed for a license. A revealing document from 1326 attests to the relationship between a Jewish woman, Sara de Sancto Aegidio, and her male apprentice, whom she agrees to train in the art of medicine.[102] Although, as far as I know, there has been no systematic research on medical practice by Jewish women, recent and not-so-recent scholarly publications provide evidence of both female medical licensees and medical practitioners in general, which demonstrates that Jewish women were involved in various areas of health care.[103]

Active Jewish involvement in medical practice might be explained by several factors, such as the advantageous social conditions that, in general, practitioners enjoyed. The practice of medicine often enhanced the possibilities of social mobility for Jewish physicians and bettered their living conditions in a time of increasing hostility toward the Jewish population in southern Europe. For example, municipal authorities were sometimes lenient in the application of restrictions to Jewish physicians – who were often exempted from wearing the badge that signaled them as Jews – or indulgent with legal punishments because of the need for medical care in their towns.[104] By providing Jewish practitioners with a craft they could "carry" with them whenever they had to leave their homes and establish themselves in a new place, the practice of medicine also eased the harsh circumstances that stemmed from imposed migration (evictions and expulsions).

Furthermore, medicine was generally acknowledged as legitimate by Jewish authorities, even by those who were opposed to "alien sciences." The principle of "saving life" undoubtedly had a part in the favorable reception granted this activity by Jews. In addition, rabbinical authorities cited socioeconomic considerations in supporting therapeutic assistance to non-Jews whenever there was an economic reward involved. In one of his responsa, Rabbi Solomon ben Adret, who banned the study of "foreign sciences" by those below the age

[101] Monica Green, "Documenting Medieval Women's Medical Practice," in García-Ballester et al., *Practical Medicine*, pp. 322–52; idem, "Women's Medical Practice and Health Care in Medieval Europe," *Signs* 14 (1989): 434–73; repr. in J. Bennet et al., eds., *Sister and Workers in the Middle Ages* (Chicago: University of Chicago Press, 1989), pp. 39–78, and again in Monica Green, *Women's Healthcare in the Medieval West* (Aldershot: Ashgate Variorum, 2000). See also Montserrat Cabré, "Women or Healers? Household Practices and the Categories of Health Care in Late Medieval Iberia," *Bulletin of the History of Medicine* 82(1) (2008): 18–51.

[102] See Shatzmiller, "On Becoming a Jewish Doctor," pp. 247–8.

[103] See Antonio Cardoner Planas, "Seis mujeres hebreas practicando la medicina en el reino de Aragón," *Sefarad* 9 (1949): 441–5; Harry Friedenwald, "Jewish Doctoresses in the Middle Ages," in *The Jews and Medicine*, pp. 217–20; Ladislao Münster, "Medichesse italiane dal XIII al XV secolo," *Lo Smeraldo* (Milan, 1952): 1–11; Joseph Shatzmiller, "Femmes médecins au Moyen Age. Témoignages sur leurs pratiques (1250–1359)," in *Histoire et société. Mélanges offerts à Georges Duby*, Vol. I (Aix-en-Provence: L'Université de Provence, 1992), pp. 167–75; Shatzmiller, *Jews, Medicine and Medieval Society*, pp. 108–12; Elisheva Baumgarten, "'Thus Sayeth the Wise Midwives': Midwives and Midwifery in Thirteenth-Century Ashkenaz," *Zion* 65 (2000): 45–74 (Heb.); idem, *Mothers and Children: Jewish Family Life in Medieval Europe* (Princeton: Princeton University Press, 2004); Carmen Caballero-Navas, "The Care of Women's Health: An Experience Shared by Medieval Jewish and Christian Women," *Journal of Medieval History* 34(2) (2008): 146–63; idem, "Prácticas de salud y cuidado de las mujeres hispanojudías en la Edad Media," in Yolanda Moreno Koch and Ricardo Izquierdo Benito, eds., *Hijas de Israel. Mujeres de Sefarad* (Cuenca: Ediciones de la Universidad de Castilla-La Mancha, 2010), pp. 253–73.

[104] See Shatzmiller, "Médecins municipaux," p. 332; Asunción Blasco, "Médicos y pacientes de las tres religiones (Zaragoza s. XIV y comienzos del XV)," *Aragón en la Edad Media* 12 (1995): 153–82, on p. 160.

of twenty-five years – medicine (and astronomy) excepted[105] – permitted the treatment of sterility in a non-Jewish woman, stating that his teacher, Naḥmanides, had done so and accepted payment for it.[106]

From the fourteenth century on, Christian authorities enacted decrees and rulings to monitor interactions in health care. In 1337, the Council of Avignon forbade Christians from employing Jewish physicians and surgeons or from taking their medicines. The same year, Robert of Provence promulgated an order revoking all previous authorizations for Jewish physicians to practice. However, the Synod of Avignon lifted the prohibitions within four years because of a shortage of medical care.[107] The Valladolid Decrees of 1411 made the living conditions of Jewish communities more difficult and included legislation that forbade Jewish and Muslim men and women from practicing as physicians, apothecaries, and surgeons. Yet official condemnations and prohibitions were generally ineffective, partially due to the fact that, because Jewish and Christian physicians' medical training was similar and they shared the same textual corpus, patients did not notice a great difference in the treatments recommended by physicians of either religion. Additionally, in my view, the religious and social scruples and reservations indicated by the legislation regulating interaction in medical practice were more present for theologians and secular authorities than for average people. Bans and regulations did not stop people from visiting or calling the practitioners to whom they entrusted their health, whatever their religion. However, overall, negative legislation contributed to the Jews' already unstable living conditions and to the social anxiety that interfaith relations often created.

AN ASSESSMENT OF WESTERN JEWS ATTITUDES TOWARD MEDICINE

The progressive creation of a Hebrew scientific library, which began in the second half of the twelfth century, was followed by a large-scale appropriation of Greco-Arabic knowledge by the Jewish communities that, established under Christian rule in northern Spain and southern France, had been unaware of that body of knowledge with which their coreligionists in the Islamic world had been familiar for centuries. At the turn of the thirteenth century, the translation into Hebrew of the *Guide of the Perplexed* stimulated the movement toward an appreciation of science, now legitimized by the writings of Maimonides. In the *Guide* Maimonides advocated the study of science as a way of attaining intellectual and spiritual perfection.[108] However, this appreciation of science met with a steady opposition, which would grow stronger as a consequence of a mixture of complex factors, including the outcome of the Maimonidean controversy and the sociopolitical situation of the Jewish communities.

Y. Tzvi Langermann and Gad Freudenthal have offered the most complete analyses to date of the Jews' changing attitudes toward science.[109] Langermann devotes a short but inspiring section of his book to the discussion of medicine,[110] whereas Freudenthal avoids discussing medicine because, he writes, the history of medicine is not "a discipline directly

[105] See Colette Sirat, *A History of Jewish Philosophy in the Middle Ages* (Cambridge: Cambridge University Press, 1985), p. 244; Y. Tzvi Langermann, "Science in the Jewish Communities of the Iberian Peninsula," in *The Jews and the Sciences in the Middle Ages* (Aldershot: Ashgate Variorum, 1999), pp. 1–54, on p. 30.

[106] Solomon ben Adret, *Še'elot u-tešuvot,* No. 120 (p. 50). See Y. Tzvi Langermann, "Fixing a Cost for Medical Care," in Kottek and García-Ballester, *Medicine and Medical Ethics*, pp. 154–62, on p. 160 n. 12.

[107] See Lepicard, "Medical Licensing," p. 59.

[108] See Freudenthal, "Science in the Medieval Jewish Cultures."

[109] See n. 38; Langermann, *The Jews and the Sciences.*

[110] Langermann, "Science in the Jewish Communities," pp. 25–32.

relevant to the history of scientific thought among Jews" and because "it has not been studied sufficiently."[111] More recently, Freudenthal has revised his earlier view. In a newly published study, he highlights the significant role that medicine played in the process of the accommodation of so-called foreign knowledge by Jews in southern Europe. Comparing learned Jewish circles' reception of Arabic and of Latin scientific and philosophical bodies of knowledge, Freudenthal shows that medicine was a specific sphere of knowledge and practice and emphasizes that, for intellectual and social reasons, its appropriation followed very different patterns from those of the other sciences and philosophy.[112]

In my view, although medicine was generally understood as an art intended to preserve health and to cure and not as a means to explain and understand nature, it was nevertheless linked (even if indirectly) to science. Maimonides' stance in this respect shows how the relationship between science and medicine was understood from the thirteenth century on.[113] The importance of his views derives not from the fact that he was a physician by training and practice, as well as a prolific medical author, but because his views became immensely influential for the development of intellectual attitudes within Jewish communities during the Late Middle Ages. In his *Regimen sanitatis,* Maimonides makes it clear that medicine had scientific value, albeit limited.[114] Later, in *On Asthma,* he explains why medicine was not a mere "art": "For the art of medicine is not like the craft of carpentry or weaving, which can be learned through observation and can be mastered through repetition, because the practice of this art [of medicine] is subordinated to [theoretical] speculation and reflection."[115] The impact of these views on later Jewish thinkers may be observed in the previously mentioned words by his disciple, Shem Ṭov Ibn Falaquera: "Wise men have stated that the practice of medicine is superior to all other occupations, for it is both a profession and science and is closest to the science of nature."[116]

Certainly the study of medicine led many individuals to become acquainted with at least the foundations of science, which resulted in a steady demand for medical teaching, a social role for those learned in medicine, and the legitimization of that study. The demand for scientific texts as a means of obtaining a good general education had some impact on the patterns of textual distribution. For example, of the many copies in which sections of Ibn Sīnā's *Canon* have been preserved, fifty-two manuscripts contain the First Book – the largest number of extant copies of any of its five books.[117] This book was devoted to general physiology, disease, health, and therapeutics and was not limited to medical practitioners, but was accessible to anyone interested in obtaining a general education.[118]

Indeed, medicine was never openly opposed by those who were against the study of science. As is well known, it was excluded from the 1305 ban on the teaching or study of "alien sciences" by Spanish and Provençal Jews under the age of twenty-five.[119] This exclusion was mainly for practical reasons, but also because medicine was considered by some apologists to be an originally Jewish art, which had been lost over the course of the years because of the

[111] See, respectively, Freudenthal, "The Place of Science," p. 130, and "Science in the Medieval Jewish Cultures," p. 26.

[112] See Freudenthal, "ʿArav and Edom."

[113] See Sarah Stroumsa, "Al-Farabi and Maimonides on Medicine as a Science," *Arabic Sciences and Philosophy* 3 (1993): 235–49.

[114] See Ferre, "The Place of Scientific Knowledge," p. 28.

[115] See Maimonides, *On Asthma,* p. 97.

[116] See n. 78.

[117] See Richler, "Manuscripts of Avicenna's *Kanon.*"

[118] Langermann, "Science in the Jewish Communities," p. 29.

[119] See Sirat, *A History of Jewish Philosophy,* p. 244.

vicissitudes of exile. However, by the fourteenth century, we can perceive some criticism and negative views, linked to a shift in the appreciation of medicine by an intellectual minority that, in deep admiration of the university system, began to view medicine as a *scientia* and to accord it the status that Christian scholars claimed for Latin medicine.[120]

[120] See Garcia-Ballester, Ferre, and Feliu, "Jewish Appreciation."

18

Alchemy in Medieval Jewish Cultures

A Noted Absence

Gad Freudenthal

The term "alchemy" is to be understood here as the doctrine affirming the possibility of the transmutation of metals, particularly of base metals, into noble ones. Related theories that are not essential to the alchemical doctrine, such as that affirming a correspondence between the seven metals and the seven planets, will be left out of consideration. The medical aspects of alchemy (such as the theory of elixir as a universal medicine or the notion that digestion – the transformation of foodstuffs into "noble" bodily parts through concoction – is a model for the maturation or transmutation of metals) will also be omitted, for want of any relevant research. Because it is limited to the medieval period, the article will leave out both Renaissance Italy, when a new cultural context radically transformed Jewish scholars' attitudes toward alchemy, and the late alchemy that developed in kabbalist contexts (e.g., by Ḥayyim Vital).

In both the Islamic and the Christian cultural areas, some Jews are known to have practiced alchemy. To the best of our knowledge, though, Jews did not write texts on alchemy in the Middle Ages. This remarkable lacuna was noted by Moritz Steinschneider, followed by Gershom Scholem,[1] and is confirmed by the virtual absence of alchemy from the classifications of the sciences found in medieval works written by Jews.[2] My purpose here is to describe what we know about the Jewish acquaintance with alchemical theory and practice and then to raise the question (without fully answering it) of why there are no alchemical writings by

For helpful remarks on an earlier version of this article, I am very grateful to Charles Burnett, Didier Kahn, Y. Tzvi Langermann, and Jean-Marc Mandosio.

[1] See Moritz Steinschneider, *Die Hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin: Kommissionsverlag des Bibliographischen Bureaus, 1893; repr. Graz: Akademische Druck- u. Verlagsanstalt, 1956), p. 273; Gershom Scholem, "Alchemie und Kabbala," *Eranos Jahrbuch* 46 (1977): 1–96; repr. in idem, *Judaica* 4, ed. Rolf Tiedemann (Frankfurt a. M., 1984), pp. 19–127 (this article supplants an earlier one with the same title in *Monatsschrift für Geschichte und Wissenschaft des Judentums* 69 [1925]: 13–30, 95–110, 371–74); Joshua Trachtenberg, *Jewish Magic and Superstition: A Study in Folk Religion* (New York: Atheneum, 1970 [1939]), p. 304 n. 1 (on northern Europe).

[2] Harry A. Wolfson, "The Classification of Sciences in Mediaeval Jewish Philosophy," in idem, *Studies in the History of Philosophy and Religion*, ed. I. Twersky and G. H. Williams (Cambridge, MA: Harvard University Press, 1973), Vol. 1, pp. 478–550.

medieval Jews. The full history of alchemy in Arabic and Hebrew remains to be written; the following remarks are no more than a few signposts.[3]

It hardly needs saying that alchemy was a flourishing discipline in the Arabophone cultural area, both on the level of practice and on that of theory.[4] I begin with a short account of what we know of Jewish practice of alchemy in Islamic cultural contexts.

A Gaonic document that preserves the story of a Jew who sought to learn the art in Egypt in order to enrich himself provides a rare and valuable insight into the social context of alchemy. This is the record of a trial held in the middle of the tenth century before Shemaryah ben Elḥanan, head of the important rabbinical academy in Fustat,[5] in the suit of Abraham bar Saʿad of Qairouan against his brother Dhabian. Abraham had entrusted Dhabian with precious stones to be traded in Egypt and also with his young son Tib (Tayyib?), who was to accompany Dhabian on his journey, learn the trade, and, eventually, after the business was completed, return home. In the course of many events, including the story relating to alchemy, Dhabian lost and then recovered the precious stones, but did not repay his brother. Thereupon the latter came to Egypt and petitioned the rabbinical court. The episode that interests us is described in his complaint as follows:

When they [Dhabian and Tib] arrived in Egypt, my brother went astray and sought things that it was not his custom to seek previously, different from all [ordinary] sorts of merchandise.[6] He began to apply himself to something that is proper to kings, an activity that whoever enters it destroys himself by his own hands, namely the Work [*maʿaśeh*] of alchemy. There was a man who was associated with the royal authorities in performing this Work. My brother Dhabian arranged with him to teach him this Work, so that he [Dhabian] might benefit from an activity that is dangerous and from which [in truth] there is no benefit. Now this charlatan lost the money of many people, while [deceitfully] suggesting to the royal authorities that he was enriching them [the authorities].[7] When the charlatan saw that he was about to be caught by the royal authorities – for all he did was deceit and foolishness – he fled and could not be found. The king's vizier sought him but could not find him. He [the vizier] was then told that [the charlatan] was smuggled to the Maghreb by Dhabian the Jew, so that he [the charlatan] would do this Work there for him and they would both enrich themselves from it. They searched for Dhabian, but he hid and could not be found. My poor son Tib and one of his relatives, however, were caught and ordered to find Dhabian. They sought for him but did not find him. Thereupon Tib and the other were flogged with whips and both died of the flogging. Dhabian remained in hiding and all the precious stones, along with everything that was his, were confiscated by the royal authorities.[8]

Here the art of transmutation is associated with high-ranking circles and is perceived as inherently perilous: It "is proper to kings, an activity that whoever enters it destroys himself by his own hands"; it is "an activity that is dangerous." Although Abraham bar Saʿad describes

[3] Raphael Patai's, *The Jewish Alchemists: A History and Source Book* (Princeton, NJ: Princeton University Press, 1994) contains useful information but is notoriously unreliable and must be used with great caution; see, e.g., Y. Tzvi Langermann's review in *Journal of the American Oriental Society* 116 (1996): 792–93 and Gad Freudenthal in *Isis* 86 (1995): 318–19. I will draw on it where appropriate in what follows. Patai discusses individuals of doubtful Jewish ancestry and converted Jews: These discussions are of no relevance or interest from the perspective of this article, whose purpose is to describe alchemy in Jewish cultural contexts.

[4] See M. Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden: Brill, 1972); idem, "Kîmiyâ (al-)," in *Encyclopedia of Islam*, 2nd ed. (Leiden: Brill, 1960–2005), 5.110aff.; F. Sezgin, *Geschichte des arabischen Schrifttums*, Vol. 4: *Alchemie-Chemie-Botanik-Agrikultur bis ca 430 H* (Leiden: Brill, 1971).

[5] Robert Brody, *The Geonim of Babylonia and the Shaping of Medieval Jewish Culture* (New Haven, CT: Yale University Press, 1998), p. 128.

[6] Perhaps, rather than "different from all [ordinary] sorts of merchandise," this should read "and for which he used [i.e., which he financed by means of] the merchandise."

[7] In other words, the charlatan used people's money to mislead the royal authorities into thinking that he had succeeded in transmuting base metals into silver or gold.

[8] S. Assaf, *Responsa Geonica* (Jerusalem: Mekize Nirdamim, 1942), p. 115 (in Hebrew); noted in Scholem, "Alchemie und Kabbala," p. 8. I am grateful to Prof. Robert Brody for his kind advice on the translation of this document.

alchemy as tempting – this is why Dhabian was attracted to it – he holds that it is based on deliberate deception and charlatanry. At the same time, his story suggests that many at the royal court continued to believe in the possibility of transmutation for a long time: Not only do many individuals entrust the alchemist with their money, believing he would soon succeed in his endeavor, but even after he disappears, some people still believe that his intention is to bring the project to completion in the Maghreb, together with his Jewish associate.

Now let us consider Jewish involvement in or awareness of alchemical theory. In Arabic culture, discussions of alchemy and its theoretical foundations can be found not only in alchemical treatises per se but also in numerous philosophical writings, some of them sympathetic to it (like those of the Ikhwān al-ṣafā) and others more circumspect or hostile (like those of the Aristotelian philosophers). Jewish authors writing in Arabic were naturally familiar with (parts of) this literature, with their awareness reflected on two levels: in specifically alchemical writings and in philosophical or religious writings that mention alchemy.

Extant codices of Arabic alchemical texts written in Hebrew script, including fragments from the Cairo Geniza, attest that Jews read and copied Arabic alchemical texts for their own use.[9] This literature still awaits exploration; at present nothing can be said of its character, dates, and scope. In the Maghreb, Jews wrote about alchemy and practiced it up to the twentieth century, an interest that may be evidence of a tradition going back to a distant past.[10] An alchemical manuscript written on the island of Jerba in 1865 may be an indication that a similar tradition existed there as well.[11] Y. Tzvi Langermann has recently described an interesting twentieth-century Yemenite alchemical codex containing excerpts from various known and unknown sources;[12] it too seems to testify to a continued interest in the Art among some Jewish circles of adepts.

More visible are the references to alchemy in several theological or philosophical texts composed by Jews in Arabic: Here alchemy is not a subject in itself and is merely invoked in various contexts, usually to make a comparison. Such passages offer us insight into how alchemy was perceived by medieval Jewish scholars in the Arabic cultural sphere. Here are some examples.[13]

In *Duties of the Hearts*, his Sufi-inspired treatise of devotional piety, written in Arabic in the second half of the eleventh century, Baḥya Ibn Paqudah calls on his readers to put their trust in God and turn away from worldly concerns. To drive his point home, he says that one who does so will have advantage over the "master of alchemy who has attained the truth [of alchemy], in both theory and practice."[14] Baḥya obviously endorsed the claims of alchemy, but putting one's trust in God is superior *even* to knowledge of how to transmute base metals into noble ones, that is, to the possession of unlimited material wealth. He then describes ten reasons why trust in God is superior to the alchemist's art, allowing readers to understand

9 On MSS other than those from the Geniza, see Patai, *The Jewish Alchemists*, pp. 367–70 (on this text see Ullmann, *Die Natur- und Geheimwissenschaften*, pp. 125–7) and 372–5. On Geniza fragments see Yosef Yinon (Paul B. Fenton), "R. Makhluf Amsalem, an Alchemist and Kabbalist of Morocco," *Peʿamim* 55 (1993): 92–123, on p. 93 nn. 3–4 (in Hebrew); Patai, *The Jewish Alchemists*, pp. 370–1.

10 Yinon, "R. Makhluf Amsalem," pp. 94–5. One of the most important Hebrew alchemical manuscripts (the Gaster manuscript, described later in n. 20) may also have been copied in Morocco.

11 Patai, *The Jewish Alchemists*, pp. 492–513.

12 See Y. Tzvi Langermann, "Transcriptions of Arabic Treatises into the Hebrew Alphabet: An Underappreciated Mode of Transmission," in F. J. and S. P. Ragep, eds., *Tradition, Transmission, Transformation* (Leiden: Brill, 1996), pp. 247–60, on pp. 255–9.

13 They are discussed, inter alia, in Patai, *The Jewish Alchemists*, pp. 144–51.

14 *Duties of the Heart*, p. 4: introduction. In his Hebrew translation (ca. 1170), Judah Ibn Tibbon added a gloss explaining "alchemist" as "one who knows how to transmute silver into gold and copper and tin into silver"; apparently he, too, considered alchemy to be valid. Baḥya ben Joseph Ibn Paqudah, *Sefer Torat ḥovot ha-levavot*, Arabic and Hebrew, ed. and trans. Joseph Qafiḥ (Jerusalem, 1973), p. 187 (and nn. 28–9).

that the alchemist uses specific instruments, handles dangerous substances, and practices a laborious and unpleasant art. Baḥya also emphasizes that alchemical knowledge, being secret and much desired, puts its possessor into danger.

By contrast, Judah Halevi, Baḥya's younger contemporary, denied the validity of alchemy. In line with his overall fideism, he argued that there is knowledge that humans cannot attain, such as how plants or living beings are generated from the four elements. He adds as an aside that "we have witnessed the failure of the alchemists . . . who tried to accomplish this."[15] "The alchemists," he explains elsewhere, "pretend that they can measure the natural fire by their scales, and that they can generate whatever they wish and transform matter, just as natural [i.e., vital] heat acts in the animal, transforming nourishment into blood, flesh, bones, and the other bodily parts. They labor in order to find an analogous fire. Yet [Judah Halevi admonishes] they are misled by [haphazard] experience they happened to have; [their enterprise is not grounded in] any theoretical reasoning."[16] Halevi clearly assumed that his readers were acquainted with alchemy and sought to refute its claims with a forceful theoretical argument directed against its very premises.[17]

Maimonides, as is well known, vehemently opposed all "Hermetic" sciences. He did not devote a special discussion to alchemy, not deeming it worthy of attention. (Recall that although he had always vigorously opposed astrology, Maimonides wrote his "Letter on Astrology" in response to an explicit request and not of his own accord.) All the same, a laconic aside offers an insight into his perception of alchemical writings. He reports that Galen doubted whether the *Humours* ascribed to Hippocrates was authentic: "What led him [to this doubt] is the fact that this book is so confused, resembling the compositions of the alchemists, or even worse than they are."[18]

Some Jewish authors drew on the alchemical simile as a purely pedagogical means, without taking a position on its veracity. Thus Judah ben Asher (the son of the noted Rosh, R. Asher ben Jeḥiel) wrote in Toledo (ca. 1350), apropos of metempsychosis, the following: "In sum, the matter with the soul and with metempsychosis is just like with alchemy: one endeavors to upgrade what is vile into something noble. And if it does not succeed the first time, one repeats it a second and third time, and pours [the preparation] from one vessel into another until it works [*ʿad yeṣeʾ mišpaṭo la-ʾor*]."[19]

Thus we see that Jewish authors who wrote on religious philosophy referred to alchemy here and there: They were not interested in it as such but used it, or rather common knowledge about it, to make comparative theological points. Note that their attitude was not uniform: Whereas Baḥya and Judah Ibn Tibbon, his translator into Hebrew, endorsed alchemy, Judah Halevi and Maimonides rejected it, although not for the same reason. There thus was no uniform "Jewish position" on alchemy; the specific concerns of Judaism had no bearing on the attitude toward this discipline and on its truth claims.

We now turn to the information on alchemy available to Jewish readers in Europe, most of whom knew no Arabic. Here a word of caution is in order. A number of codices containing

[15] *Kuzari* 3.23 (ed. D. A. Baneth and H. Ben-Shammai [Jerusalem: The Magnes Press, 1977], p. 114).

[16] Ibid. 3.53 (p. 133).

[17] For an informed discussion of this passage and of Halevi's sources, see Harry A. Wolfson, "Hallevi and Maimonides on Design, Chance, and Necessity," pp. 1–59 in idem, *Studies in the History of Philosophy and Religion*, Vol. 2, ed. I. Twersky and G. H. Williams (Cambridge, MA: Harvard University Press, 1977), on pp. 40–7.

[18] Arabic text and Hebrew translation in R. Joseph Qafiḥ, ed. and trans., *Rabbenu Mošeh ben Maimon, ʾIggerot* (Jerusalem: Mossad ha-Rav Kook, 5754 [=1994]), p. 144; also in Maimonides, *Commentary on the Aphorisms of Hippocrates, Hebrew Translation by R. Moses Ibn Tibbon* (= *Medical Works*, Vol. 3), ed. S. Muntner (Jerusalem: Mossad ha-Rav Kook, 1961), p. 3.

[19] Judah ben Asher, *Zikron Yehudah* (Jerusalem: Makon Yerushalayim, 2005), Section 102.

anthologies of Hebrew alchemical texts translated from various languages are known today.[20] The manuscripts themselves are late (sixteenth and seventeenth centuries), as are several other manuscripts of individual alchemical works, of which we still lack a complete list. However, as these manuscripts were at least in part copied from older manuscripts, some of the texts they include may be medieval. None of these anthologies or manuscripts has been subjected to serious study, and so we cannot at present make any definitive statements concerning the corpus of alchemical texts available in Hebrew in the medieval period. The following sketch presents only texts that we know with certainty are medieval and is therefore ad minima.

The works of Baḥya and Halevi were translated into Hebrew very early, by Judah Ibn Tibbon in 1161 and 1167, respectively: These were certainly the earliest occasions for Hebrew readers to become aware of the existence and nature of alchemy as well as of its controversial validity. In the next century, one of the very few known full-blown alchemical texts, which was certainly translated from Arabic into Hebrew in the medieval period, saw the light in Provence (the translator is unknown): This is *ʾEm ha-meleḵ* (The King's Mother), ascribed to Abū Aflaḥ as-Sarqusti (i.e., of Syracuse in Sicily), an otherwise unknown, perhaps fictitious author who is also credited with *Sefer ha-Tamar* (The Book of the Palm-Tree), which discusses the bringing down of *pneumata*.[21] The Arabic originals are unknown. The purpose of *ʾEm ha-meleḵ* is explicitly to persuade readers of "the veracity of the philosophically grounded art called among the scholars 'alchemy,' which allows you to succeed in accumulating money and in gathering fortune": The wish to accumulate wealth is justified by saying that transmutation will allow the addressee (if successful) to satisfy his material needs so that he can pursue his solitary study undisturbed and continue to delve into "profound inquiries."[22] The work consists of three "gates." The first, as the author himself states, is derived from works of natural philosophy and is a sort of introduction to the "artificial" (i.e., alchemical) procedures described later on.[23] The author discusses Aristotle's two-exhalation theory, the relationship of metals to planets, and various metals and other substances. In his account of the properties of metals based on the sulfur–quicksilver theory of metal formation, the author remarks that "by a well-known contrivance, tin can be transmuted into silver . . . just as we said of silver that its nature is close to that of gold [so that] through a thoughtful contrivance we can transmute it into gold."[24] The author then digresses into the following short theoretical comment:

> Should we be taken to task by one of the deniers, who affirm that it is impossible that one species be transmuted into another (with the exception of a species of wheat that transmutes into the species *yul* and the hazel tree which also transmutes into another species), we will retort: this is not [an operation]

[20] These codices are (1) the famous so-called Gaster manuscript, now London, British Library, Or. 10289. It was first described by Moses Gaster himself in *The Jewish Encyclopedia* (New York: Funk and Wagnalls, 1901–6), pp. 1:328–32, and thereafter by B. Suler in "Alchemie," *Encyclopedia Judaica*, Vol. 2 (Berlin, 1928), col. 137–59 (translated in *Encyclopedia Judaica* [Jerusalem: Keter, 1971], Vol. 2, pp. 542–49) and by Patai, *The Jewish Alchemists*, pp. 420–34; see the study of one of its texts in Y. Tzvi Langermann, "The Hebrew Version of *Semita recta*, an Alchemical Treatise Attributed to Albertus Magnus," *Aleph* 5 (2005): 273–84; (2) MS Manchester, John Rylands University Library, No. 1435, described in Patai, *The Jewish Alchemists*, pp. 381–92; (3) MS Berlin, Staatsbibliothek, Or. Oct. 514, described ibid., pp. 407–16.

[21] *Sefer ha-Tamar* was edited in extenso with fragments of *ʾEm ha-meleḵ* in Gershom Scholem, *Sefer ha-Tamar. Das Buch von der Palme des Abû Aflah aus Syracus. Ein Text aus der arabischen Geheimwissenschaft. Nach der allein erhaltenen hebräischen Übersetzung*, ed. and trans. G. Scholem (Hannover: Lafaire, 1926; Jerusalem: Workmen's Printing Press, 1927). Scholem translated only *Sefer ha-Tamar* and not the excerpts from *ʾEm ha-meleḵ*. These are presented and translated almost in full in Patai, *The Jewish Alchemists*, pp. 98–118. On *Sefer ha-Tamar* see also Reimund Leicht, *Astrologumena Judaica* (Tübingen: Mohr Siebeck, 2006), pp. 306–8.

[22] *ʾEm ha-meleḵ*, ed. Scholem, p. 39.

[23] Ibid., p. 43, bottom.

[24] Ibid., pp. 42–3. The text wrongly has *kesef ḥai* instead of *kesef*.

in which one species is transmuted into another. For [in nature] silver is concocted in the bowels of the earth and becomes gold with the passage of a long time. [Hence, there is no change of species.] The masters of this art [alchemy] accomplish this very same concoction in a short time.[25]

By "one of the deniers" the author in all likelihood had in mind Ibn Sīnā, for the argument refuted is precisely his.[26] Concluding the discussion of the properties of metals, the text states that all metals can be transformed into silver or gold "by means of the procedures of this art, as I will make clear when disclosing to you its secrets in the next gate."[27] The second gate distinguishes three modes of "operations," gives a theoretical account of them, and then describes a considerable number of operations.[28] The third gate contains practical recipes, which the author says he received from "the ancients" and tried out himself.[29] *ʾEm ha-meleḵ* afforded its readers with an insight into the nature of alchemy and gave them a taste of alchemical literature.

Although we cannot say how widely *ʾEm ha-meleḵ* (preserved in at least three manuscripts) was studied, sections of it were incorporated into two other compositions. One is the very popular encyclopedic work *Šaʿar ha-šamayim*, by Gershon ben Solomon.[30] This, incidentally, provides us with a *terminus ante quem* for the Hebrew version of *ʾEm ha-meleḵ* (ca. 1280), which is confirmed by the fact that it is also quoted by Qalonymos ben Qalonymos in the 1320s.[31] Gershon drew only on the first gate of *ʾEm ha-meleḵ*, omitting the alchemical recipes: He incorporated the short paragraph just quoted into his encyclopedia, thereby giving his readers the basics of the definition of alchemy and the controversy surrounding its validity. However, Gershon revised the paragraph; he distanced himself from the possibility of transmutation, slightly modified the argument, and included additional information:

Some scholars affirm that by a well-known contrivance it [tin] can be transmuted into silver, for it is close to its nature, [so that] with [i.e., under the action of] a slight cause it can be saved from its accidental qualities. This is just as they said that of silver that it is close in nature to gold, and by thoughtful artifice can be transmuted into gold. This art is called "alchemy." Aristotle denies it and holds that it is impossible that one species change into another species. (With the exception of two species: a species of wheat occasionally becomes another species called *yul*; and the species of hazel tree, which, when it becomes very old, for a long period ceases to produce fruit and thereafter produces fruits of another species. And there is yet a third species.) Some scholars believe in this contrivance, arguing that [what is involved] is not the transmutation of one species into another. Rather, silver, when it is concocted for a long time in the heat of the earth, becomes gold, [so that] the practitioners of this art [alchemy] bring about this same concoction in a short time.[32]

25 Ibid., p. 43.

26 *Shifā* V.5, in E. J. Holmyard and D. C. Mandeville, eds. and trans., *Avicennae De congelatione et conglutinatione lapidum*, Being Sections of the *Kitâb al-Shifâʾ* (Paris: Geuthner, 1927), pp. 85–6 (text), pp. 41–2 (translation); see also the introduction, pp. 5–6. This provides a *terminus post quem* for the date of the Arabic original of *ʾEm ha-meleḵ*. Perhaps the author draws here on an Arabic text in which Ibn Sīnā's objection was presented together with its refutation; this would explain the vague reference to "the deniers" of alchemy. I am grateful to Jean-Marc Mondosio for this observation.

27 *ʾEm ha-meleḵ*, ed. Scholem, p. 43.

28 Ibid., p. 44. The descriptions of the operations, omitted by Scholem, are translated in Patai, *The Jewish Alchemists*, pp. 108–13.

29 *ʾEm ha-meleḵ*, ed. Scholem, p. 45.

30 Gershon ben Solomon, *Sefer Šaʿar ha-šamayim* 2.2 (ed. Warsaw: Isaac Goldman, 1875, pp. 14–15); *ʾEm ha-meleḵ*, ed. Scholem, pp. 41–43. Noted by Scholem in his Hebrew introduction, p. 3 n. 2 and p. 41 n. 1; see also Patai, *The Jewish Alchemists*, pp. 98–9.

31 *ʾEm ha-meleḵ*, ed. Scholem, Hebrew introduction, pp. 3–4; German introduction, p. 2.

32 Gershon ben Solomon, *Sefer Šaʿar ha-šamayim* 2.2 (ed. Warsaw, 1875, p. 15). Note that Gershon writes, "*Some scholars affirm that* by a well-known contrivance," whereas *ʾEm ha-meleḵ* simply states, "By a well-known contrivance. . . . "

Gershon deliberately avoided taking a position on the matter, contenting himself with a factual presentation of the arguments pro and con, drawing exclusively on natural philosophy. Very telling is the phrase "Aristotle denies it and holds that it is impossible that one species change into another species," in which Gershon replaced the phrase "one of the deniers" in *ʾEm ha-meleḵ* with Aristotle's name. This change must be based on information Gershon obtained from Christian scholars. For, as Jean-Marc Mondosio and Carla Di Martino have shown, shortly before the end of the thirteenth century, Alfred of Sareshel incorporated a section on minerals abstracted from Ibn Sīnā's *Shifā*, which included the objection against the possibility of transmutation, into the Latin version of the fourth book of Aristotle's *Meteorology*. As a result, Ibn Sīnā's argument was attributed to Aristotle in Latin works on natural philosophy. Only a scholar familiar with Alfred's text could have identified "one of he deniers" as Aristotle.[33] Gershon indeed reports that in his book he drew on information obtained in conversations with Christian scholars.[34]

The second work in which a section from *ʾEm ha-meleḵ* is interpolated is *ʾIggeret ha-sodot* (Epistle of the Secrets), wrongly ascribed to Maimonides. To what may be the basic version of this text (to be described presently), at least one manuscript appends a long passage taken almost verbatim from *ʾEm ha-meleḵ*,[35] which thus seems to have enjoyed some audience.

ʾIggeret ha-sodot is another straightforward alchemical text that was available to Hebrew-reading scholars.[36] The fact that it represents itself to be a letter from Maimonides to his cherished student Joseph ben Judah implies that it was written by a Jew and for Jewish readers. The occurrence of Arabic terms that are translated into the (Castilian?) vernacular suggests that the text was originally written in Arabic and later translated into Hebrew in the Iberian peninsula, or (less likely) composed by a Jew who lived in Christian Spain at a time when some Jews still knew Arabic, whereas the vernacular was more helpful for others. On both hypotheses it would seem that *ʾIggeret ha-sodot* dates from the late medieval period. The work discusses transmutation, as well as various remedies and procedures of astrological magic.

The authors of Hebrew encyclopedias varied in their handling of alchemy. The idea of transmutation is briefly mentioned in the encyclopedia *Midrash ha-ḥoḵmah* by Judah ben Salomon (ca. 1240), who opines that "the "Great Art" is impossible.[37] Gershon ben Solomon, we saw, presented it in a few words and without taking an explicit position on its validity. His older contemporary Shem Ṭov Ibn Falaquera, the author of (among other things) the

33 Jean-Marc Mandosio and Carla Di Martino, "La *Météorologie* d'Avicenne (*Kitâb al-Shifâ* V) et sa diffusion dans le monde latin," in Andreas Speer and Lydia Wegener, eds., *Wissen über Grenzen: Arabisches Wissen und lateinisches Mittelalter* (Berlin: de Gruyter, 2006), pp. 406–24. See also below, text following n. 71.

34 See Lothar Kopf, "The *Leʿazim* in the *Šaʿar ha-šamayim* of Gershon ben Shlomo," *Tarbiz* 24 (1955): 150–66, 274–89, 410–25; 25 (1956): 36–43 (in Hebrew); repr. in idem, *Studies in Arabic and Hebrew Lexicography*, ed. M. H. Goshen-Gottschein (Jerusalem: Magnes Press, 1976), Hebrew section, pp. 139–95.

35 Patai, *The Jewish Alchemists*, pp. 309–13. The manuscript is Moscow, State Library, Guenzburg 315, ff. 87a–91b.

36 Translated in part in Patai, *The Jewish Alchemists*, pp. 300–13. The manuscript is Munich, Bayerische Staatsbibliothek, Cod. Hebr. 14, ff. 29b–33b. Shailat reports a short alchemical epistle, also addressed by "Maimonides" to his "honored student," as one folio (31b) of MS Manchester 1435 (see n. 20); I am unable to check how these two texts are related. See I. Shailat, ed., *Letters and Essays of Moses Maimonides* (Maʿaleh Adummim, 5748 [1988]), 2.693 (in Hebrew).

37 In his encyclopedic work *Midrash ha-ḥoḵmah*, Judah ben Solomon writes, "You know that 'it is not study [*midraš*] that matters, but deeds [*maʿaśeh*]' (M Avot 1.7). Of what use is [the gentiles'] wisdom, seeing that you find among their sages more vices and deceit than among the ignorant? For they use their wisdom for idolatry only, or for lust, or to acquire renown in the eyes of the authorities, or to produce gold by what they call 'the Great Art [*melaḵah gedolah*],' which, being impossible, will never be successful. Of such futilities Solomon said: 'a companion of harlots wastes his wealth' (Prov. 29:3)" (MS Oxford, Bodleian Library, Mich. 551 (= Neubauer 1321), f. 196v). I am grateful to Resianne Fontaine for providing me with the text and for her advice on the translation. The passage was cited and translated in M. Steinschneider, "Waage und Gewicht," *Jeschurun* 9(2) (1878): 65–97, on p. 85.

encyclopedia *Deʿot ha-filosofim* (Opinions of the Philosophers), by contrast, did not discuss alchemy in his vast work, presumably because alchemical theory was incompatible with his strictly Aristotelian outlook.[38] In his Hebrew translation of al-Fārābī's *Iḥṣā al-ʿulūm* (Enumeration of the Sciences), however, he explicitly noted the absence of alchemy and other "arts" from al-Fārābī's account: "These branches have not been noted by some of the philosophers when they enumerated the sciences," he remarked, adding, "to make the book complete, I have mentioned them." Ibn Falaquera in fact interpolated a very short passage, drawn from Ibn Sīnā, in which he writes that the purpose of alchemy "is to divest mineral substances of their properties . . . and endow some of them with properties of other [substances], thus accomplishing the production of gold and silver from other substances."[39]

Quite important is the concise statement of the nature of alchemy available to the Hebrew-reading scholar in another, somewhat later, Hebrew version of al-Fārābī's *Iḥṣā al-ʿulūm*, prepared by Qalonymos ben Qalonymos in 1314.[40] This influential text, the only "monograph" on the classification of the sciences available in Hebrew, includes an exposition of the "sciences, arts, and devices" deriving from natural science, namely medicine, alchemy, and magic, each described with its goals, methods, instruments, and so on.[41] Al Fārābī characterizes alchemy as follows: "It is known to produce gold and silver from what is not gold and silver in actuality, with the same holding for the other metals." He further explains that alchemists use fire to produce the noble metals from the appropriate proximate matter, thus accomplishing through human art what in nature is brought about by the sun. He notes that alchemical writings are divided among those devoted to practice and those bearing on theory and provides a brief overview of the equipment used.[42] It is noteworthy that al-Fārābī's translator, Qalonymos, seems to have had a special interest in alchemy: We have a medieval report "of the *Book of Poisons* by Jābir Ibn Ḥayyān, which the learned Maestro Calo [i.e., Qalonymos ben Qalonymos] found in the treasures of our king and master [Robert of Anjou], may he rest in peace."[43] The text in question has recently been discovered by Y. Tzvi Langermann.[44] The passage on alchemy in the Hebrew version of the *Iḥṣā* had some impact on posterity, for it is quoted in extenso in two fifteenth-century commentaries on Judah Halevi's *Kuzari*.[45]

[38] Mauro Zonta, "Mineralogy, Botany and Zoology in Hebrew Medieval Encyclopedias," *Arabic Sciences and Philosophy* 6 (1996): 263–315, on p. 287.

[39] Moritz David, ed., *Schemtob ben Josef ibn Falaqueras Propädeutik der Wissenschaften Reschith Chokmah* (Berlin: M. Poppelauer, 1902), p. 53. As noted by Mauro Zonta, ed. and trans., *La "Classificazione delle scienze" di Al-Fârâbî nella tradizione ebraica. Edizione critica e traduzione annotata della versione ebraica di Qalonymos ben Qalonymos ben Meʾir* (Turin: Silvio Zamorani Editore, 1992), p. xxvi, this short interpolation is a literal quotation from Ibn Sīnā's *Epistle on the Division of the Intellectual Sciences*; see J. Michot, "Les sciences physiques et métaphysiques selon la *Risālah fī aqsām al-ʿulūm* d'Avicenne: essai de traduction critique," *Bulletin de philosophie médiévale* 22 (1980): 64–71, on p. 67. In this passage, Ibn Sīnā only defines alchemy, without taking position on its validity.

[40] Zonta, *La "Classificazione delle scienze."*

[41] This passage is not found in the extant Arabic manuscripts of the work. Whether Qalonymos interpolated it into his Hebrew version or translated an otherwise unknown Arabic redaction of the *Iḥṣā* is a matter of dispute. See ibid., pp. xxv–xxvi; S. Stroumsa, "Al-Fārābī and Maimonides on Medicine as Science," *Arabic Sciences and Philosophy* 3 (1993): 235–49, on pp. 242–4.

[42] Zonta, *La "Classificazione delle scienze,"* pp. 27–8 (Hebrew text), p. 93 (Italian translation).

[43] M. Steinschneider, "Kalonymos ben Kalonymos," in idem, *Gesammelte Schriften*, ed. H. Malter and A. Marx (Berlin: M. Poppelauer, 1925), p. 197 =*Zeitschrift der Deutschen Morgenländischen Gesellschaft* 9 (1855): 843. The Hebrew title of Jābir's treatise is given as *Sefer ha-ʿArasim*, probably *Kitāb al-sumūm* (on which see Ullmann, *Die Natur- und Geheimwissenschaften im Islam*, p. 208).

[44] Y. Tzvi Langermann, "Some New Medical Manuscripts from St. Petersburg," *Korot* 13 (1998/9): 9–20.

[45] Moritz Steinschneider, *Al Farabi (Alpharabius). Des arabischen Philosophen Leben und Schriften mit besonderer Rücksicht auf die Geschichte der Griechischen Wissenschaft unter den Arabern* (St. Petersburg [Mémoires de l'Académie impériale des Sciences de St.-Pétersbourg, VIIe série, vol. XIII, 4], 1869; repr. Amsterdam: Philo Press, 1966), pp. 84,

A short characterization of alchemy was available in the Hebrew version of the very popular medieval treatise on governance: *Secret of Secrets*, a composite text whose brief final chapter is devoted to "special" (i.e., arcane) sciences. The short version of this pseudepigraphic work in Arabic, ascribed to Aristotle, was rendered into Hebrew by an anonymous translator (fourteenth century?) and is extant in a large number of manuscripts.[46] The chapter gives some practical instructions on the use of poisons and stones and includes two short paragraphs on alchemy. The first reads as follows:

> The science of the sciences is to know the production of silver and gold. Its genuine [production] is impossible, for it is impossible to imitate God (exalted be He) in His essential acts. This having been made clear, the accidents are attainable; there is no impediment with respect to them. This [impossibility] is part of the necessary laws [*nimmusim*]. It is therefore permissible to manipulate the accidents.[47]

The position here expressed is that changing the *essence* of metals through human action is impossible, because this would mean imitating God. Consequently, base metals cannot *really* be transmuted into silver or gold. Their accidents, however, can be changed by artifice.[48] There follows the beginning of what seems to be a recipe for such a manipulation, which involves the application of arsenic to quicksilver. However, the text of the recipe (at least as published) seems incomplete. The second paragraph on alchemy in *Secret of Secrets* consists of the following short moralizing exhortation: "Know that alchemy [*ha-qimiʾah*] is a science that is not true. [True are] rather ploughing and sowing. Therefore you should cherish them most, and through them you will prosper and see your governance and dominion increase."[49]

This is roughly all we know with certainty about the transfer of knowledge on alchemy from Arabic into Hebrew. There seem to have been no medieval translations of alchemical writings from Latin into Hebrew. By contrast, a genuine although short manual of alchemical practice was translated into Hebrew from an Iberian vernacular. This text, hitherto unnoticed, is

244–5, mentions Solomon ben Judah of Lunel (1424) and Nathaniel ben Neḥemiah Kaspi (1425). The first of these texts has recently been edited: See Dov Schwartz, ed., *Commentary on the* Kuzari: Ḥešeq Šelomoh *by R. Solomon ben Judah of Lunel* (Ramat Gan: Bar-Ilan University Press, 2007), pp. 312–13 (in Hebrew). Solomon ben Judah seems to misunderstand al-Fārābī's position as denying the validity of alchemy. Patai (*The Jewish Alchemists*, pp. 314–16) noted the passage but was unaware of its source.

46 The Hebrew text was published in Moses Gaster, "The Hebrew Version of the '*Secretum Secretorum*,' a Mediaeval Treatise Ascribed to Aristotle," *Journal of the Royal Asian Society* (1907): 879–912 (Hebrew text); ibid. (1908): 111–62 (translation), 1065–84 (introduction). On the extant manuscripts and deficiencies of Gaster's edition and translation, see Amitai I. Spitzer, "The Hebrew Translations of *Sod ha-sodot* and Its Place in the Transmission of the *Sirr al-asrâr*," pp. 34–54 in W. F. Ryan and Charles B. Schmitt, eds., *Pseudo-Aristotle: "The Secret of Secrets": Sources and Influences* (London: Warburg Institute, 1982), on pp. 36–7. On the history of *Secrets of Secrets*, see Steven J. Williams, *The "Secret of Secrets": The Scholarly Career of a Pseudo-Aristotelian Text in the Latin Middle Ages* (Ann Arbor: University of Michigan Press, 2003).

47 Text in Gaster, *Journal of the Royal Asian Society* (1907), p. 31 (Hebrew numbering), Section 125. The translation is mine, amending some readings after the Arabic text in M. Grignaschi, "Remarques sur la formation et l'interprétation du *Sirr al-asrâr*," in Ryan and Schmitt, *Pseudo-Aristotle: "The Secret of Secrets,"* pp. 3–33, on p. 33 n. 3. This work may have been known to Petrus Alphonsi, the famous writer and polemicist translator who, prior to his conversion in 1106, was known as Moses the Spaniard, and who seems to allude to it in a lost treatise in Latin; Petrus would of course have known the work in Arabic. See Alfred Büchler, "A Twelfth-Century Physician's Desk Book: The *Secreta Secretorum* of Petrus Alphonsi Quondam Moses Sephardi," *Journal of Jewish Studies* 37 (1986): 206–12.

48 This is roughly the Avicennian position as noted in Grignaschi, "Remarques," p. 32.

49 Gaster, *Journal of the Royal Asian Society* (1907), p. 32 (Hebrew numbering), Section 128. Oddly enough, in the long version of the *Secret of Secrets*, alchemy is praised as one of the major arcane sciences that a king should know.

found in a manuscript kept at the cathedral of Toledo.[50] The manuscript, dating from the late fifteenth century, contains the Greek text of works by Euclid; the probably autograph Hebrew text has been written into its large margins. Only some 18 pages (of the 170 in the manuscript) are reused in this way. The hand is difficult to decipher and the Hebrew awkward and hard to understand. The text, which gives practical instructions on how to accomplish "the Art" and prepare the Stone, seems not to be the work of a scholar, but rather of a layman who took an interest in (practical) alchemy and wrote the tract for his own use. This would explain why it seems to have had no influence on posterity. As far as we know, it is the only pre-Renaissance Hebrew text that includes the alchemical symbols for the seven planets and metals. This text, which deserves study, does not contain any illustrations of alchemical apparatus.

Hebrew-reading scholars thus could acquire general information about alchemy, but they had no access to specialized theoretical or practical alchemical literature. It is no wonder, therefore, that no alchemical works were composed in Hebrew in the Middle Ages. All we find are occasional references to it, similar in character to those found in the writings of Baḥya Ibn Paqudah and Judah Halevi. Joseph Ibn Kaspi (1280–after 1332), for example, discusses miracles and tries to drive home the point that some extremely rare natural processes must not be confused with those that are impossible. In this context he refers to alchemy: "There is no doubt that the art of alchemy is a true art, so that the one who knows it can replace copper with gold." It is only because its operations are so little known that many people think that the transmutation of base metal into gold is impossible.[51] In a similar rhetorical move, but taking alchemy to be false, Joseph Albo (ca. 1380–1444) draws the following analogy: The aversion to what is improper that is acquired through divine law is everlasting, just as genuine silver can be melted again and again without losing its nature; the aversion to what is improper that is acquired from conventional law, by contrast, is like counterfeit silver. As he explains, "of counterfeit silver, produced by alchemical art, some is such that it may withstand one melting without betraying its bad quality, but if melted a second time its poor quality becomes apparent. Other [counterfeit silver] may withstand two meltings, other three or four or five, but in the end its poor quality is discovered. . . . [By contrast,] pure silver, which is refined in the bowels of the earth and undergoes numerous successive refinements [there], is pure of all falseness, dross, and alloy, so that it can never change afterwards, even if melted many times." So too, Albo concludes, "the aversion to the improper that is acquired through the Torah is 'pure, enduring forever' (Ps. 19:10)."[52] Abraham Alṭabib, in the middle of the fourteenth century, writes (in connection with Abraham Ibn Ezra's commentary on Exod. 32:20) that "gold is never consummated by fire . . . and books of alchemy describe this specific quality (*segullah*), which is a great wonder, especially in the eyes of goldsmiths who know its nature."[53] Discussing *segullot,* Simeon ben Ṣemaḥ Duran (1361–1444) takes the antithetical stance: he remarks en passant that alchemy is an error and that "many men have

[50] Toledo, Archivo y biblioteca capitulares, MS Z-98–13 (Institute for Microfilmed Hebrew Manuscripts, Jerusalem [= IMHM] Film no. 7353). See the description of the manuscript in J. Millás Vallicrosa, "Los manuscritos hebraicos de la biblioteca capitular de Toledo," *Al-Andalus* 2 (1934): 395–429, on pp. 424–5. Millás was not aware of the text's distinctive alchemical content. Incipit: *RISHONAH, hu' še-yeš melek̲ 'al kullam, šemei šamayim ba-šeniyyah* ("First: there exists a King over all; the heavens of the heavens is the second . . . ").

[51] *Ṭirat ha-kesef* (= *Sefer ha-Sod*) I.11; in *Mišneh kesef,* ed. I. H. Last, Vol. 1 (Pressburg: Abraham Alqalay and Sons, 1905), pp. 12–13.

[52] *Sefer ha-ʿIqqarim,* I.8; modified slightly from I. Husik, ed. and trans., *Sefer ha-Ikkarim. Book of Principles by Joseph Albo,* Vol. 1 (Philadelphia: Jewish Publication Society, 1929), pp. 88–9. See Patai, *The Jewish Alchemists,* pp. 297–9.

[53] Dov Schwartz, *Amulets, Properties and Rationalism in Medieval Jewish Thought* (Ramat Gan: Bar-Ilan University Press, 2004), p. 348 (in Hebrew). See also Patai, *The Jewish Alchemists,* p. 150.

gone astray and wasted their lives, owing to the desire to accumulate wealth."[54] In the last decade of the fifteenth century, the physician Samuel Abulafia, an exile from Spain, warned Sultan Bayazid II (reigned 1481–1512) that a man who proposed to transmute lead into gold was a swindler: This shows that the question whether alchemy is valid continued to be discussed in medieval Spain and that there was a tradition of considering it to be a fraud.[55] In the Latin and vernacular literatures, too, alchemists were often represented as deceivers (or self-deceivers).

Another intellectual context in which alchemy plays a role, albeit again a minor one, is that of kabbalah. Contrary to a widely held belief, medieval kabbalists were little interested in alchemical theory. Nor did they practice alchemy; kabbalistic manuscripts written before 1500 do not contain alchemical recipes.[56] The reason for this, as Gershom Scholem pointed out, is that the basic assumptions of kabbalah are incompatible with those of alchemy. For the latter, gold is of course the theoretical centerpiece and the practical goal of the Art; in kabbalah, by contrast, silver usually stands for the masculine, right-hand side, whereas gold, the symbol of the left, feminine side, has a subordinate status. This clash of basic motifs in the two bodies of belief accounts for the almost total absence of alchemical lore in Hebrew kabbalistic thought prior to circa 1500.

Nevertheless, Moses de Leon's *Šeqel ha-qodeš* explicitly alludes to transmutation. He assigns gold, silver, copper, and tin to the four elements (fire, water, air, and earth, respectively), as well as to the four cardinal points (an idea not known from alchemical sources), and goes on to say this: "Copper is red, and this is what makes it capable of giving rise to the two natures [of gold and silver]. For those who are expert in this Art employ nature to produce the nature[s] of gold and silver out of copper."[57] This passage may have a kabbalistic meaning.[58] The *Zohar*, too, contains a single passage in a theosophic discussion that assumes the transmutation of metals (including base metals into noble ones).[59]

The sources available to these kabbalists of the late thirteenth century still have to be identified. Their scattered utterances had little influence, however. Writing in his youth and still in Spain (ca. 1480), R. Joseph Taitatzak is the first to bring alchemy to bear on mystical theology and to postulate that knowledge of the kabbalah is required for the practice of alchemy; significantly, this line of thought was not pursued by Taitatzak's students. The rapprochement between alchemy and the Spanish "wing" of kabbalah (including its extensions, notably in the Lurianic kabbalah developed in Safed) begins only in the sixteenth century.[60] The strong association of alchemy and kabbalah comes from Christian kabbalah.[61]

54 Shimon ben Ṣemaḥ Duran, *Magen ʾavot*, II.1 (Livorno, 1785), p. 10a. The entire passage is translated in Patai, *The Jewish Alchemists*, pp. 264–7.

55 Israel M. Ta-Shma, "Sefer Taʿalumot ḥoḵmah le-R. Eliyahu Galliyano," in *Keneset meḥqarim. ʿIyyunim ba-sifrut ha-rabbanit bi-ymei ha-beinayim*, Vol. 3, *Italyah u-vizantiyon* [Studies in Medieval Rabbinic Literature, Vol. 3: Italy and Byzantium] (Jerusalem: Mosad Bialik, 2005), pp. 331–8, on p. 334. The passage has been edited, translated, and discussed by Y. Tzvi Langermann, "From My Notebooks: A Compendium of Renaissance Science: *Taʿalumot Ḥoḵmah* by Moses Galeano," *Aleph* 7 (2007): 285–318, on pp. 311–16.

56 The following short discussion is based on the fundamental essay by Gershom Scholem: "Alchemie und Kabbala," esp. pp. 11–13.

57 Moses de Leon, *Šeqel ha-qodeš*, ed. A. W. Greenup (London, 1911; repr. Jerusalem: n.p., 1969), p. 120; ed. Charles Mopsik (Los Angeles: Cherub Press, 1996), p. 95; German translation in Scholem, "Alchemie und Kabbala," p. 20. The passage is slightly corrupt.

58 Scholem, "Alchemie und Kabbala," p. 21f.

59 Ibid., pp. 25–8. Another possible trace of alchemical lore in the *Zohar* is the frequent allusion to the "dross" of gold and its identification with "left" side of the cosmos (ibid., pp. 30–2).

60 See Gerrit Bos, "Hayyim Vital's *Kabbalah Maʿasit we-Alkhimiyah* (Practical Kabbalah and Alchemy), a Seventeenth-Century 'Book of Secrets,'" *Journal of Jewish Thought and Philosophy* 4 (1994): 55–112.

61 It left its mark, inter alia, on the very popular pseudepigraphic work entitled *Le Livre des figures hiéroglyphiques* composed toward the end of the sixteenth or beginning of the seventeenth century (and first published in

Scanty evidence of alchemical practices by Jews in Christian Europe has come to light. Michael Scot mentions "a Jew called Master Jacob" whom he allegedly saw performing alchemical operations, but we know nothing about this person; the recent suggestion that he is to be identified with Jacob Anatoli, the translator who for a while resided at the court of Frederick II of Hohenstaufen in the 1230s, has little to recommend itself.[62] The most reliable information at our disposal on medieval Jewish practice of alchemy in Christian lands concerns two alchemists in the service of, or connected to, the king of Aragon.[63] The first is Magister (or "Don Rabbi") Menaḥem, who was accused in Palma de Majorca in 1345 of being an "experimenter and necromancer" and of counterfeiting metals. Menaḥem was generously paid by the gentile who sheltered him. The lawsuit apparently brought Menaḥem to the attention of King Pedro IV of Aragon-Catalonia, a learned and enlightened sovereign who employed many Jewish scientists and scholars. In July 1346 he appointed Menaḥem his personal physician, entrusted him with what seem to be alchemical experiments, and also considered himself to be his disciple in astrology. The following points in Menaḥem's revelatory career are noteworthy: (1) From a sociological perspective, the alchemist's social role is associated with those of the necromancer and the astrologer, that is, with the practice of occult arts, which were often perceived as threatening. (2) The alchemist does not work on his own, but rather under patronage, provided by a rich bourgeois (as it seems) or the king. (3) The alchemist is perceived as a money counterfeiter. (4) As a result of all of these points, although the alchemist's profession was a way to achieve social mobility, it was also perilous (as already observed by Baḥya Ibn Paqudah).

The second alchemist is Caracosa Samuel of Perpignan, known from Jewish sources to have been a dignitary of the community. In 1396, King Juan I, Pedro's son and successor, granted Caracosa Samuel the right to practice alchemy unhindered; unlike Menaḥem, he was not employed by the crown itself. From the decree it becomes clear that Caracosa Samuel's activity encountered serious resistance in his hometown and that without the king's firm

1612), which circulated under the name of Nicolas Flamel (1330–1418). The Jewish motifs in Pseudo-Flamel's text – including a book by Abraham the Jew, the utility of kabbalah, Jewish masters – illustrate that in this period, Jewish lore, especially kabbalah, was perceived as intimately linked to alchemy and as a prestigious discipline. Patai (*The Jewish Alchemists*, pp. 218–30) surveys these motifs; however, because he did not realize that the works he describes are late forgeries, he believes they can tell us something about Jewish alchemists in the fourteenth century. In particular, the manuscripts attributed to "Abraham le Juif" (Patai reproduces the title page of one of them, p. 227) are forgeries later than and inspired by the publication of the *Figures hiéroglyphiques* in 1612. On the current state of Flamel studies, see Nicolas Flamel, *Écrits alchimiques*, Postface de Didier Kahn (Paris: Les Belles Lettres, 1993), pp. 99–116; Kahn, "Un témoin précoce de la naissance du mythe de Flamel alchimiste: *Le Livre Flamel* (fin du XV^{e} siècle)," *Chrysopœia* (Paris) 5 (1992–6): 387–429. On the relationship between Christian kabbalah and alchemy in the Renaissance, see François Secret, *Hermétisme et Kabbale* (Naples: Bibliopolis, 1992).

62 Colette Sirat, "Les traducteurs juifs à la cour des rois de Sicile et de Naples," in G. Contamine, ed., *Traduction et traducteurs au Moyen Age* (Paris: Éditions du CNRS, 1989), pp. 169–91, on pp. 174, 190–1. Jacob Anatoli was a faithful follower of Maimonides and an Aristotelian, a stance that is incompatible with an interest in or practice of alchemy. There indeed is no trace of interest in or awareness of alchemy in his *Malmad ha-talmidim*, and certainly not in its numerous reports of Anatoli's conversations with Michael Scot. Furthermore, Scot says he met the Jewish alchemist in "Sarzanum" or "Sarranum," which is not a place in Sicily. The identification is all the more suspect because the Pseudo-Avicennian alchemical treatise *De anima* (twelfth century) mentions a Jew named "Jacob" who, the author says, "taught me many things" (*Liber Abuali Abincine de anima in arte alchemiae*, in *Artis chemicae principes Avicenna atque Geber* [Basel, 1572], p. 68). This passage found its way to Vincent of Beauvais, who also mentions a Jew named "Jacob" or "Jacob Aranicus the Jew"; see *Speculum naturale*, Book VII, chapter 87 (= ed. Douai 1624, Vol. 1, col. 480); an improved text is given in M. Berthelot, *La Chimie au moyen âge* (Paris: Imprimerie Nationale, 1893), 1.302. (The references are noted by Patai, in *The Jewish Alchemists*, pp. 96–97, 140, who took the Pseudo-Avicennian text to be authentic.) I am indebted to Jean-Marc Mandosio for his observations on Pseudo-Avicenna and to Eva Albrecht for her advice on Vincent. Of course none of this excludes the possibility that Scot indeed met a Jewish alchemist by the name of Jacob.

63 For what follows see Patai, *The Jewish Alchemists*, pp. 234–7.

support, he ran the risk of being persecuted by the authorities. Caracosa Samuel was a trustee of the community, which apparently did not consider his activity as religiously illicit or as jeopardizing it; nonetheless, this activity is not mentioned in Jewish sources.

Magister Menaḥem and Caracosa Samuel are the medieval Jewish alchemical practitioners about whom we have the most detailed definite information. We should bear in mind, however, that they apparently did not write alchemical tracts in Hebrew and that the little we know about them and their alchemical activities comes entirely from non-Jewish sources. The silence of Hebrew sources about practical alchemy is thus no indication that it did not exist. In fact, research in the archives of the small town of Morvedre in the kingdom of Valencia has recently brought to light the existence of two fifteenth-century Jewish alchemists, also unknown from Jewish sources.[64] So too we have scattered information about a few otherwise-unknown Jewish alchemists in southern Germany who engaged in producing silver and gold and, like Magister Menaḥem and Caracosa Samuel in Spain, did so under princely patronage.[65] One is a certain Salman Teublein, who concluded contracts with various local rulers about practicing his Art in their territories and sharing its secrets with them. The Habsburg archduke Sigismund (reigned in the county of Tyrol 1439/46–90) employed a Jew named Seligmann as both his personal physician and alchemist. Nuremberg may have been a center for Jewish alchemical activity: In 1441 the sexton of the synagogue was branded on his forehead and cheeks because he practiced alchemy; in 1472 we have information about a Jew who is described as "the master of the alchemists in Nuremberg" and who indeed produced and disseminated counterfeit coins. Lastly, we have also information about a Jew called Perret Symuel who practiced alchemy in the Midi and Piedmont and was executed near Geneva in 1444. The common denominator of all these cases is that the Jewish alchemist worked for a local ruler, apparently an extension of the Jews' traditional role in handling financial affairs for their lords. Here, too, we have no information about any of these persons from Jewish sources; their alchemical activities were not part of the Jewish cultural field. They presumably were based on non-Hebrew writings (in Latin or the vernacular) and are thus a consequence of some Jews' increasing integration into the host cultures. These intriguing cases of Jewish alchemists in fifteenth-century Spain and Germany have come to light only recently, and our knowledge of them is as yet very incomplete; more research in this domain is called for.

A fifteenth-century Ashkenazi manuscript may be related to these developments. It contains a sundry collection of medical items, none of which is alchemical, translated from the vernacular. However, it also describes the distillation of various substances for medical purposes (of one of these operations the text says, "this art is called sublimation") and includes one page with four illustrations of instruments such as the still, the furnace, and the alembic.[66] To be sure, the apparatus depicted is pharmaceutical, not specifically alchemical. Still, the manuscript gives evidence that Jews were sufficiently integrated into the majority culture as to be able to acquire and use up-to-date instruments that could be employed for alchemical purposes as well.

64 See Mark D. Meyerson, *A Jewish Renaissance in Fifteenth-Century Spain* (Princeton, NJ: Princeton University Press, 2004), p. 155 ("Samuel 'of Granada,' a licensed Jewish physician and alchemist of uncertain origins who lived and practiced in the city of Valencia from 1414 to 1416"); pp. 205 (n. 71) and 215 (a certain R. Abraham who taught Hebrew to conversos but was later baptized and practiced alchemy as "master Luis").

65 The following paragraph is based on Gert Mentgen, "Jewish Alchemists in Central Europe in the Later Middle Ages: Some New Sources," *Aleph* 9 (2009): 345–52.

66 MS Moscow, Guenzburg 1481 (IMHM 48525), ff. 35b–37a. See Langermann's review of Patai's *The Jewish Alchemists* (see n. 3). The manuscript is described in Moritz Steinschneider, "Eine medizinische hebräische Handschrift," *Magazin für die Wissenschaft des Judentums* 12 (1885): 182–214, on p. 187.

This overview seems to confirm the statements by Steinschneider and Scholem: Alchemical theory was not a part of medieval Jewish culture, especially in Europe. Much the same holds of alchemical practice, in which medieval Jews were generally uninterested; the known exceptions, reviewed herein, are both few and late, and they confirm the rule.

This is a remarkable cultural phenomenon. Let us leave the Islamic cultural context, of which too little is as yet known, out of consideration. In Christian Europe, the absence of Hebrew translations of alchemical literature sharply contrasts with the vogue enjoyed by alchemy among Latin scholars, who, beginning in the twelfth century, translated scores of alchemical texts from Arabic. This dissimilarity suggests that we are dealing with something that is more than a random historical fact. True, as already noted, the alchemical activities of Magister Menaḥem, Caracosa Samuel, and their colleagues in Valencia and Germany are known to us only from non-Jewish sources, so that our information about Jewish interest in alchemy is certainly incomplete. However, the absence of such information is in itself a cultural datum, for it implies that alchemy was not part of Jewish culture as such. Thus medieval European Jews' disinterest in alchemical theory and practice calls for explanation. No systematic research has been done on this question; the following brief remarks are to be understood as tentative suggestions. I first consider alchemical practice, followed by a few comments on the absence of discussions of alchemy by Jewish scholars.

Magister Menaḥem, we recall, was put on trial in 1345 for being an "experimenter and necromancer" and for counterfeiting metals. Some of the Jews just mentioned who practiced alchemy a century later were also persecuted. This points to two factors that presumably contributed to the Jews' shunning of practical alchemy. First, it was often perceived as associated with the occult and with black magic, making it particularly hazardous for a Jew. Second, and probably more important, is the association of alchemy with the production of counterfeit money. Beginning circa 1300, temporal rulers placed debased gold and silver coinage into circulation, often employing alchemists to this end. The ecclesiastic authorities disapproved of this practice and also barred members of monastic orders from practicing alchemy (it was incompatible with their vow of poverty), although this rule was often violated. Even though alchemy was part of the system of the sciences – the *quaestio de alchimia* was commonly addressed in the natural science curriculum – it was too controversial to be taught as a normal discipline in the universities (some scholars accepted it, even enthusiastically, whereas others rejected it as dubious or fake and occasionally even condemned it as a devilish science).[67] These considerations may throw some light on the attitude toward alchemy in the Jewish minority culture. According to this hypothesis, the association of alchemical practice with counterfeiting money inclined Jews, a social group with many members who were moneylenders, to adopt an attitude similar to that of the church and thus to stay away from everything related to alchemy and even to exclude it from the system of the natural sciences.[68] The dominant influence on Jewish thought of Averroes, who identified science with the Aristotelian corpus of natural philosophy, may have reinforced this trend. Indeed,

[67] See the excellent historical analysis in Barbara Obrist, "Die Alchemie in der mittelalterlichen Gesellschaft," in Christoph Meinel, ed., *Die Alchemie in der europäischen Kultur- und Wissenschaftsgeschichte* (Wiesbaden: Otto Harrassowitz, 1986), pp. 33–59, on pp. 51–9. I am indebted to Jean-Marc Mandosio for this point.

[68] In "Waage und Gewicht," p. 84, Moritz Steinschneider wrote, "Die Juden verstanden sich auf die reelle Goldwaage zu gut, um sich vom 'Stein der Weisen' zu narren machen zu lassen." (This spirited remark should not be taken too literally, for the alchemists disposed of assaying techniques, and not all of them were deluded into thinking that the gold they produced was real.) More matter of fact, Guy Beaujouan suggested that "On oublie trop souvent que, par exemple, dans la célèbre décrétale de Jean XXII (généralement datée de 1317), l'hostilité à l'alchimie est d'abord liée au problème de la fausse monnaie. Dans les communautés juives, les courtiers en métaux précieux n'auraient sans doute guère apprécié les scandales imputables à des coreligionnaires alchimistes"; see G. Beaujouan, "Les orientations de la science latine au début du XIV^{e} siècle," in Gad Freudenthal, ed., *Studies on Gersonides, A Fourteenth-Century Jewish Philosopher-Scientist* (Leiden: Brill, 1992), pp. 71–80, on p. 80.

the few Jewish alchemists known to us (Menaḥem, Caracosa Samuel of Perpignan, the Jewish alchemists in Germany) tended to work for or under the patronage of temporal rulers. It should, however, be remembered that no information has come to light about a Jewish community's persecution of one of its members for alchemical activities.

The special social character of alchemy as an esoteric science transmitted from master to student was certainly a contributing factor to its absence from the Jewish agenda. For one thing, alchemical theory and practice cannot be learned unless the novice is initiated by a master. Laboratory work requires practical instruction, and the alchemical literature typically employs a coded language that is metaphoric and symbolic; consequently, personal instruction by a master is even more important in this domain than it is in others. Given the trust (and in many cases also the shared spirituality) that must exist between master and disciple in alchemy, we may suppose that a young Jew would find it difficult to locate a Christian master to initiate him into it. For another, the special social structure of alchemy also prevented Jews from obtaining alchemical manuscripts, and this presumably contributed to the lack of Hebrew translations of alchemical literature from Arabic or Latin. In the Middle Ages, owners of manuscripts were in general reluctant to allow them to be copied, because a manuscript containing a rare text was particularly precious.[69] Some books were more difficult to borrow than others: The corporations of physicians at times formally barred its members from selling books to Jews.[70] Alchemical books were likely even harder to obtain. We have already mentioned the report that Qalonymos ben Qalonymos found a manuscript of Jābir's *Book of Poisons* in the library of Robert of Anjou; that this was deemed worth reporting (a little before the middle of the fourteenth century) shows that it was a rare occurrence. That we find a few Jews practicing alchemy in the fifteenth century is presumably due to the fact that by then the social barriers between Jews and gentiles were lower, reducing the intensity of both impediments.

Consider now the fact that Jewish scholars interested in natural science almost never discussed the possibility of transmutation, in stark contrast to their Christian contemporaries. One reason is presumably the low visibility of alchemy as a practice within the Jewish community. Another factor is more fortuitous.[71] As already mentioned in passing, the *translatio vetus* of Aristotle's *Meteorology* contained an interpolated text – derived from Ibn Sīnā's chapter on meteorology in his *Shifā* – that introduced alchemy into the Aristotelian corpus. The passage in question is a Latin paraphrase of three chapters of Ibn Sīnā's *Meteorology*, which Alfred of Sareshel (before 1200) composed and added to the translation of the four authentic books of the *Meteorology* (the first three translated by Gerard of Cremona, the fourth by Henry Aristippe). Although Alfred knew that the text was by Ibn Sīnā, he nonetheless ascribed it to Aristotle, apparently acting in good faith, believing it to convey an authentic Aristotelian doctrine. Albertus Magnus soon argued that the text was in fact by Ibn Sīnā, but many readers took it to be Aristotelian; in any event it became part of the Aristotelian bookshelf studied in the universities. Now one aspect of the interpolated text is its attention to alchemy: It denies (although not vehemently) the possibility of transmutation, but at the

Documents from court cases in England in which Jews (and others) were prosecuted for counterfeiting money do not mention alchemy: See Zefira Entin-Rokeah, "Money and the Hangman in Late-13th-Century England: Jews, Christians and Coinage Offences Alleged and Real," *Jewish Historical Studies* 31 (1988–90): 83–109; ibid. 32 (1990–92): 159–218. I am grateful to Judith Olszowy-Schlanger for this reference.

69 See, e.g., Ann Brener, "Stealing Wisdom: A Story of Books (and Book-Thieves) from Immanuel of Rome's *Maḥbarot*," *Prooftexts* 28(1) (2008): 1–27.

70 For a lucid overview of the economic aspects of the use of medical books, see J. Shatzmiller, "Livres médicaux et éducation médicale: à propos d'un contrat de Marseille en 1316," *Medieval Studies* 42 (1980): 463–70.

71 For what follows see Mandosio and Di Martino, "La *Météorologie* d'Avicenne." I am grateful to Jean-Marc Mandosio for his helpful advice on this issue.

same time presents the sulfur–mercury theory of the origin of metals, which was often used to support the argument that transmutation was possible. As a result of this interpolation, the *quaestio de alchimia* was discussed by numerous commentators and frequently debated in the universities; in addition, alchemy was considered to be a science going back to antiquity, thereby acquiring legitimacy. Thus the Scholastic university's theoretical interest in alchemy was at least in part due to the fact that Ibn Sīnā's discussion of it had been interpolated into the Aristotelian corpus. Nothing similar happened in Hebrew – Hebrew-reading scholars had almost no access to information about alchemy – so they never developed a serious interest in alchemy.

In conclusion, it can be said that alchemy occupied only a minor place in medieval Jewish practice and thought. In the Islamic cultural sphere, some Jews studied and practiced alchemy down to the modern period, but the prevalence of this phenomenon is unknown. In Christian Europe, Jewish scholars were aware of the existence of alchemy and of its teachings, and they drew on it in several contexts. However, contrary to what had happened in both the Arabic and Latin cultural contexts, alchemy did not become a focal point of theoretical discussions. As for alchemical practice, although a few Jewish alchemists have come to light, there seems to have been a great reticence to get involved with the practice of alchemy, especially before the fifteenth century: The Jews' economic role in society was probably the most important factor for their reluctance to touch an activity that was related to counterfeiting.

19

The Science of Language among Medieval Jews

Judith Olszowy-Schlanger

LINGUISTICS

The nature and development of medieval Hebrew linguistics have always held a place of honor in Hebrew and Jewish studies. Grammatical and lexicographical treatises were among the earliest Hebrew works printed and studied in early modern universities.[1] A peak of research activities occurred in the second half of the nineteenth and early twentieth centuries, when a wealth of grammatical texts were edited from original manuscripts and the first historical syntheses were compiled.[2] More recently, the past two or three decades have also witnessed a considerable increase in the number and quality of research projects and publications dedicated to medieval Hebrew linguistics. This resurgence is due to several factors, of which the most important concern the recognition of the history of linguistics in general as a discipline in itself, on the one hand, and the renewal of interest in medieval manuscripts, on the other. Thanks to these factors, the study of the earliest stages of Oriental Hebrew linguistics has recently gained added impetus with the discovery of previously unknown books and fragments, chiefly in the Firkovich collection in St. Petersburg and among fragments from the Cairo Geniza.[3] In addition, the better-known works of "classical" grammarians and various works written in Western Europe have recently been "rediscovered," studied, and critically edited from original manuscripts.

These new discoveries and scholarly publications confirm that Hebrew linguistics was far from marginal a science during the Middle Ages: Some 150 linguistic works are known today (see Tables 19.1–19.3); around 2.5 percent of all surviving Hebrew manuscripts deal with grammar. Linguistic texts and ideas traveled at great speed between different countries and communities. From its inception, the science of Hebrew grammar was a relatively neutral meeting ground for proponents of different ideas and beliefs. Particular aspects of grammatical analysis could sometimes become controversial, as in the case of the rivalry between Menaḥem ben Saruq and Dunash Ibn Labrāṭ in Cordoba, in the tenth century, or between Judah Ibn Janāḥ and Samuel ha-Nagid some fifty years later. Nevertheless, Hebrew grammar appeared devoid of overt ideological challenges of the kind raised by

[1] Thus, *Sefer Šorašim* of David Qimḥi of Narbonne and *He-ʿAruḵ* of Nathan ben Yeḥiel of Rome were printed in Italy even before 1480.

[2] Notably Dukes (1844a), Bacher (1892), Hirschfeld (1926), and Jastrow (1887–8a, 1887–8b, 1889). Cf. Fellman (1974) and Dotan (1977). For more recent syntheses, see Yellin (1945), Téné (1971), Loewe (1994), Eldar (1989), Del Valle Rodríguez (1982, 2000a, 2002), Zwiep (1996), and Schippers (1997).

[3] On the need to "map" Hebrew linguistic material preserved in manuscript collections, see Maman (2003), p. 303.

TABLE 19.1. *Hebrew Linguistics in Arabic*

Date	Place	Author	Title	Genre	Ref. (p.)
10th cent.	Orient	anonymous	Hebrew-Arabic biblical glossaries	L	382
10th cent.	Orient	anonymous	*Kitāb al-Muṣawwitāt*	Ph/M	386
10th cent.	Orient	anonymous	*Seder ha-Simanim*	Ph/M	387
10th cent.	Orient	anonymous	Treatise on consonants	Ph/M	387
10th cent.	Orient	anonymous	Treatise on the schwa	Ph/M	387
902 (ca. 920)	Egypt (Baghdad)	Saadia Gaon	*Sefer ʾEgron. Kitāb ʾuṣūl al-shiʿr al-ʿibrānī*	L	383, 384
920–930?	Tiberias-Baghdad	Saadia Gaon	*Kitāb faṣīḥ lughat al-ʿibrāniyyn*	G, Ph/M	371, 372, 384, 387
Early 10th cent.	Baghdad	Saadia Gaon	*ʾAlfāẓ al-Mishna*	L	382
Early 11th cent.	Baghdad?	Saadia Gaon	*Kitāb al-sabiʿin lafẓa al-mufrada*	L	382
10th–11th cent.	Orient	anonymous	Abridgment of Saadia Gaon's *Kitāb faṣīḥ*	G, Ph	372
Mid-10th cent.	Jerusalem	David ben Abraham al-Fāsī	*Kitāb jāmiʿ al-ʾalfāẓ*	L	367, 383, 384
Mid-10th cent.	North Africa	Judah Ibn Quraysh	*Risāla*	L	384
Mid-10th cent.	North Africa	Judah Ibn Quraysh	Treatise on biblical words beginning with *aleph*	NA	384
End 10th cent.	Jerusalem	Abū Saʿid Yefet ben ʿAli	Abridgment of David ben Abraham al-Fāsī's *Kitāb jāmiʿ al-ʾalfāẓ*	NA	383
Late 10th cent.	Jerusalem	Yūsuf Ibn Nūḥ	*The Diqduq*	GC	374–376
10th cent.	Orient	Saʿid Shīrān	Treatise on verbs	G	376
10th cent.	Orient	anonymous	Treatise on nouns	G	376
11th cent.	Orient	anonymous	Abridgment of Yūsuf Ibn Nūḥ's *Diqduq*	GC	374
11th cent.	Orient	ʿAli ben Suleimān	Abridgment of David ben Abraham al-Fāsī's *Kitāb jāmiʿ al-ʾalfāẓ*	L	383
ca. 1000	Cordoba	Ḥayyūj, Abū Zakariyya Yaḥyā	*Kitāb al-ʾafāl ḍawāt ḥurūf al-lin*	G	378
ca. 1000	Cordoba	Ḥayyūj, Abū Zakariyya Yaḥyā	*Kitāb al-ʾafāl ḍawāt al-mithlayyin*	G	378
ca. 1000	Cordoba	Ḥayyūj, Abū Zakariyya Yaḥyā	*Kitāb al-tanqīṭ*	Ph/M	378
ca. 1000	Cordoba	Ḥayyūj, Abū Zakariyya Yaḥyā	*Kitāb al-nutaf*	GC	378, 382
1020s–30s?	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj	*Hidāyat al-qāriʾ*	Ph/M	377, 387, 390
1020s–30s?	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj?	*Mukhtaṣar* (Abridgment) of *Hidāyat al-qāriʾ*	Ph/M	376, 377, 387
1026	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj	*Kitāb al-Mushtamil*	G, L	376, 377, 386
1037?	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj	*Kitāb al-Kāfī*	G	367, 377
1040s?	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj	*Al-Mukhtaṣar*	G	377, 387
1040s?	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj	*Kitāb al-madkhal ila ʿilm al-diqduq fī ṭuruq al-lugha al-ʿibrāniyya*	G	377
1040s?	Jerusalem	Abū al-Faraj Hārūn Ibn al-Faraj	*Tafsīr al-ʾalfāz al-ṣaʿaba*	L	377, 382
Mid-11th cent.	Jerusalem	anonymous ("the second grammarian of Jerusalem")	*Kitāb al-ʿuqūd fī taṣārīf al-lugha al-ʿibrāniyya*	G	377

Date	Place	Author	Title	Genre	Ref. (p.)
First half 11th cent.	Irak	Samuel ben Ḥofni Gaon	*al-Madkhal ʾilā ʿilm al-Mishna wal-Talmud* (ch. 143)	L	385
First half 11th cent.	Irak	Hai ben Sherira Gaon	*Kitāb al-ḥāwī*	L	386
1012	Cordoba or Saragossa	Abū al-Walīd Marwān Jonah Ibn Janāḥ	*Kitāb al-mustalḥaq*	G	379, 390
First half 11th cent.	Saragossa	Abū al-Walīd Marwān Jonah Ibn Janāḥ	*Risālat al-tanbīh*	G	379
First half 11th cent.	Saragossa	Abū al-Walīd Marwān Jonah Ibn Janāḥ	*Risālat al-taqrīb wa-al-tashīl*	G	379
First half 11th cent.	Saragossa	Abū al-Walīd Marwān Jonah Ibn Janāḥ	*Kitāb al-taswiʾa*	G	379
First half 11th cent.	Saragossa	Abū al-Walīd Marwān Jonah Ibn Janāḥ	*Kitāb al-tashwīr*	G	380
ca. 1050	Saragossa	Abū al-Walīd Marwān Jonah Ibn Janāḥ	*Kitāb al-tanqīḥ* *Kitāb al-lumaʿ* *Kitāb al-ʾuṣūl*	G L	365, 379, 380, 388 380
First half 11th cent.	Granada	Samuel ha-Nagid Ibn Nagdela and his circle	*Rasāʾil al-rifāq*	G	380
First half 11th cent.	Granada	Samuel ha-Nagid Ibn Nagdela	*Kitāb al-ḥujja*	NA	380
ca. 1040	Granada	Samuel ha-Nagid Ibn Nagdela	*Kitāb al-istighnā*	NA	385
ca. 1050	Toledo	Abū Ibrahīm (Isaac) Ibn Yashūsh	*Kitāb al-taṣārīf*	NA	380
Early 11th cent.	Cordoba	Moshe ben Samuel Ibn Gikatilla	*Kitāb al-taḍkīr wa-al-tānīth*	G	380
End 11th cent.	Toledo	Judah Ibn Balʿam	*Kitāb ḥurūf al-maʿanī*	G	380
End 11th cent.	Toledo	Judah Ibn Balʿam	*Kitāb al-ʾafʿāl al-mushtaqqa min al-ʾasmaʾ*	G	380
End 11th cent.	Toledo	Judah Ibn Balʿam	*Kitāb al-irshād*	G	380
End 11th cent.	Toledo	Judah Ibn Balʿam	*Kitāb al-tajnīs*	L	385
End 11th cent.	Saragossa	Levi ben Jacob Ibn Altabban	*Ha-Mafteaḥ*	NA	380
End 11th–beg. 12th cent.	Spain	Isaac Ibn Barūn	*Kitāb al muwazana bayna al-lugha al-ʿibrāniyya wa al-lugha al-ʿarabiyya*	G	380
12th cent.	Spain or Provence?	Jacob ben Eleazar	*Kitāb al-kāmil*	G	407, 409
12th cent.	Yemen	Nathanael Fayyumi			
12th cent.	Palestine (Samaritan)	Iṣḥaq Ibrāhīm ben Faraj ben Marūt	*Kitāb al-tawṣiʾa*	G	389
Early 13th cent.	Palestine	Tanhum Yerushalmi	*al-Murshid al-kāfī*	L	390
13th cent.	Palestine (Samaritan)	anonymous	*Ha-Meliṣ*	L	389
13th cent.	Yemen	anonymous	Abridgments of Abū al-Faraj Hārūn's *Hidāyat al-qāriʾ*	Ph/M	390
End 13th–beg. 14th cent.	Egypt	Solomon ben Mubārag	*Kitāb al-taysīr*	L	390
1468	Granada	Saadia ben Maimon Ibn Danān	*al-Ḍarūrī fī al-lugha al-ʿibrāniyya*	G	411
1468?	Granada	Saadia ben Maimon Ibn Danān	*Kitāb al-ʾuṣūl* (*Sefer ha-Šorašim*)	L	411

Note: L = lexicography; G = grammar; GC = grammatical commentary; Ph/M = phonetics/Masorah; NA = not available: the work is known only through quotations.

TABLE 19.2. *Hebrew Linguistics in Hebrew*

Date	Place	Author	Title	Genre	Ref. (p.)
9th cent.	Orient	anonymous	Hebrew-Greek biblical glossary	L	381
9th cent.	Iraq	Ṣemaḥ ben Paltoi	*ʿAruḵ*	NA	385
9th–10th cent.	Palestine (Tiberias)	Aaron ben Moses ben Asher	*Diqduqei ha-Ṭeʿamim*	Ph/M	370, 386, 387, 391
9th–10th cent.	Orient	anonymous	Hebrew-Greek mishnaic glossary	L	381
Third quart. 10th cent.	Cordoba	Menaḥem ben Saruq	*Maḥberet*	L	367, 385, 386, 388, 391, 394, 398, 400, 405
Third quart. 10th cent.	Cordoba	Dunash ben Labrāṭ ha-Levi	*Tešuvot Dunaš*	L, G	359, 384, 388, 391, 394, 398, 399, 405
Third quart. 10th cent.	Cordoba	Dunash ben Labrāṭ ha-Levi	*Tiqqun ha-šegagot*	L, G	384
Third quart. 10th cent.	Cordoba	Iṣḥaq Ibn Capron, Judah Ibn Daūd (= Ḥayyuj?) and Iṣḥaq Ibn Gikatilla	*Tešuvot talmidei Menaḥem*	L, G	384
Third quart. 10th cent.	Cordoba	Yehudi ben Sheshet	*Tešuvot*	L, G	384
Early 11th cent.	Mainz	Machir ben Judah	*Alpha Beta de-R. Maḵir*	NA	385
1040s	Saragossa	Solomon Ibn Gabirol	*Ha-ʿAnaq*	G	381
Late 11th cent.	Byzantium	anonymous	*Meʾor ʿayin*	G	378, 391, 392
Late 11th cent.	Byzantium	Joseph the Constantinopolitan (ha-Qustandini)	*ʿAdat devorim*	G, Ph/M (passages)	391
1070–1101	Rome	Nathan ben Jeḥiel of Rome	*ʿAruḵ*	L	359, 388, 398, 399, 400, 404
1140	Rome	Abraham Ibn Ezra	*Sefer Moznayim*	G	392, 399, 401, 402
1143	Rome	Menaḥem ben Solomon	*ʾEven boḥan*	L	397, 399
ca. 1140–45	Italy	Abraham Ibn Ezra	*Śefat yeter*	G	399
ca. 1145	Lucca	Abraham Ibn Ezra	*Sefer ha-Yesod* (*Yesod diqduq* or *Śefat yeter*)	G	399
1145	Mantua	Abraham Ibn Ezra	*Sefer Ṣaḥut*	G	399, 404
1148	Constantinople	Judah Hadassi	*ʾEškol ha-kofer*	G (passages)	376, 378, 391, 392
ca. 1150–55	Provence	Abraham Ibn Ezra	*Śafah berurah*	G	400
ca. 1150–55	Provence	Joseph ben Isaac Qimḥi	*Sefer Zikkaron*	G	396
Mid-12th cent.	Northern France	Samuel ben Meir (Rashbam)	*Dayyqot* (or *Dayyaqut*) *le-R. Šemuel*	G, Ph/M	394, 404
Mid-12th cent.	Northern France	Jacob ben Meir, (Rabbenu Tam)	*Haḵraʿot*	L, G	395, 404
1161	Salerno	Solomon Ibn Parḥon	*Maḥberet he-ʿAruḵ*	L, G	395, 397, 400, 407
12th cent.	Germany or Northern France	Yequtiel ha-Kohen ben Judah (=Zalman ha-Kohen)	*ʿEin ha-qoreʾ*	Ph/M	393, 395
1165	Narbonne	Joseph ben Isaac Qimḥi	*Sefer ha-Galui*	G	395, 404, 405
Second half 12th cent.	Narbonne	Moses ben Joseph Qimḥi	*Seḵel ṭov*	G	405
Second half 12th cent.	Narbonne	Moses ben Joseph Qimḥi	*Sefer Darḵei lešon ha-qodeš,* (*Mahalaḵševilei ha-daʿat*)	G	405
Second half 12th cent.	Narbonne	Moses ben Joseph Qimḥi	*Sefer Taḥbošet*	NA	405

Date	Place	Author	Title	Genre	Ref. (p.)
End 12th cent.	Narbonne	David ben Joseph Qimḥi	*ʿEṭ sofer*	G (passages)	406
1205	Narbonne	David ben Joseph Qimḥi	*Sefer Mik̲lol*	G	369, 406, 407, 408, 411
1205	Narbonne	David ben Joseph Qimḥi	*Sefer Šorašim*	L	359, 396, 401, 403, 406, 407
13th cent.	Northern France	anonymous	Hebrew–Old French biblical glossaries	L	397, 398
ca. 1250	London	Moses ben Yom Ṭov ha-Naqdan	*Dark̲ei ha-niqqud ve-ha-negginot*	Ph/M, G	393, 395, 396
Mid-13th cent.	London	Moses ben Isaac ha-Nessiya	*Lešon limmudim*	NA	396
ca. 1260	London	Moses ben Isaac ha-Nessiya	*Sefer ha-Šoham*	G, L	396, 397
Late 13th cent.	Germany	Samson ha-Naqdan	*Ha-Šimšoni (Ḥibbur ha-qonim)*	G, Ph/M	397, 409
Late 13th cent.	Germany	Mordecai Yair	*Mafteaḥ šel diqduq*	G	397
13th cent.	Baghdad	Isaac ben Eliezer ha-Levi	*Śefat yeter*	G	390
13th cent.	Baghdad	Isaac ben Eliezer ha-Levi	*Ha-Riqmah*	G	390
Second half 13th cent.	Byzantium	Aaron ben Joseph ha-Rofeʾ the Elder	*Kelil Yofi*	G	392
Late 13th cent.	Provence	Abraham ben Isaac Bedersi	*Ḥotam Tok̲nit*	L	408
End of 13th cent.	Spain	Meshullam Ezovi from Béziers	*Aggudat ʾezov*	G	410
13th cent.	Provence?	David ben Solomon?	*Petaḥ devarai*	G	402, 407
13th–14th cent.	Provence?	Meir ben Solomon ben David	Addition to *Petaḥ devarai*	G	
ca. 1300	Italy (Rome)?	Benjamin ben Judah Bozecchi	*Haqdamah*	G	400, 402
ca. 1300	Italy (Rome)?	Benjamin ben Judah Bozecchi	*Mavoʾ ha-lašon* (or *ha-diqduq*)	G	400
ca. 1300	Rome	Immanuel ben Solomon of Rome	*ʾEven boḥan*	G (passages)	400
13th–14th cent.	Provence?	Joseph ben David ha-Yevani	*Menorat ha-maʾor*	L	392, 393
13th–14th cent.	Germany or France	R. Senior (or Shneor)		Ph/M, G	397
14th cent.	Rome	anonymous	Hebrew verb paradigms in Judeo-Italian	G	400, 405
Mid-14th cent.	Provence	Joseph ben Abba Mari Kaspi	Commentary on Ibn Janāḥ's *Sefer ha-Riqmah*	NA	408
Mid-14th cent.	Provence	Joseph ben Abba Mari Kaspi	*Šaršot kesef*	L	408
Mid-14th cent.	Provence	Joseph ben Abba Mari Kaspi	*Retuqot kesef*	G	408
Mid-14th cent.	Lunel	Solomon ben Abba Mari Yarḥi	*Lešon limmudim*	G	408
Early 15th cent.	Italy	Pereṣ Traboṭ	*Maqreʾ dardeqei*	L	401
1403	Catalonia	Isaac ben Moses Profiat Durān ha-Levi	*Maʿaśeh ʾEfod*	G	401, 410
1429	Naples	Joseph ben Judah Zarco	*Rav peʿalim*	G	401
1429	Naples	Joseph ben Judah Zarco	*Baʿal ha-lašon*	L	401

(*continued*)

TABLE 19.2 *(continued)*

Date	Place	Author	Title	Genre	Ref. (p.)
1437–48	Arles	Isaac ben Nathan ben Kalonymus (Mordecai Nathan)	*Me'ir nativ*	L	408
1454	Mantua	Judah ben Jeḥiel (Messer Leon)	*Livnat ha-sappir*	G	401
ca. 1476?	Lisbon?	David Ibn Yaḥya ben Solomon	*Lešon limmudim*	G	393, 410, 412
1480	Italy	Solomon ben Abraham of Urbino	*'Ohel mo'ed*	L	401
1484	Naples	Moses ben Shem Ṭov Ibn Ḥabib of Lisbon	*Peraḥ šošan*	G	401
1480s	Naples	Moses ben Shem Ṭov Ibn Ḥabib of Lisbon	*Marpe' ha-lašon*	G	401
1504	Padua	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	commentary on Moses Qimḥi's *Mahalak̲ ševilei ha-da'at*	G	403
1517	Rome	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Sefer Harqavah*	G	403
1517	Constantinople	Elisha ben Abraham ben Mattathiahu	*Magen David*	G	410
1518	Rome	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Sefer ha-Baḥur*	G	403
1518	Rome	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Luaḥ be-diqduq ha-pe'alim ve-ha-binyanim*	G	403
1520	Rome	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Pirqei 'Eliyahu*	G	403
ca. 1520	Constantinople	Solomon ben Jacob Almoli	*Halik̲ot šewa'*	Ph/M	393
1523	Venice	Abraham ben Meir de Balmes	*Miqneh 'Avram*	G	402
1536	Venice	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Sefer Zik̲ronot*	Ph/M	403
1538	Venice	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Masoret ha-masoret*	Ph/M	403
1538	Venice	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Tuv ṭa'am*	Ph/M	403
1540	Rome	David ben Joseph Ibn Yaḥya	Abridgment of David Ibn Yaḥya ben Solomon's *Lešon limmudim*	G	412
1541	Isny	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Tišbi*	L	403
1541	Isny	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Meturgeman*	L	404
1542	Isny	Elias Levita (Elijah ben Asher (Baḥur) ha-Levi Ashkenazi	*Šemot devarim*	L	404

Note: L = lexicography; G = grammar; GC = grammatical commentary; Ph/M = phonetics/Masorah; NA = not available: the work is known only through quotations.

TABLE 19.3. *Hebrew Translations of Arabic Works on Hebrew Linguistics*

Date	Place	Translated by	Title	Translated from	Ref. (p.)
11th cent.	Spain	Moshe ben Samuel Ibn Gikatilla		Ḥayyūj	379, 388
1140–42	Rome	Abraham Ibn Ezra	*Sefer ʾOtiyot ha-naḥ*, *Sefer Poʿolei ha-kefel* and *Sefer ha-Niqqud*	Ḥayyūj	379, 388
1171	Lunel	Judah Ibn Tibbon	*Sefer ha-Riqmah Sefer Šorašim*	Ibn Janāḥ's *Kitāb al-tanqīḥ*	385, 388
1170s	Lunel	Judah Ibn Tibbon	*Sefer ha-Heʿarah*	Ibn Janāḥ's *Kitāb al-tanbīh*	388
End 12th cent.	Béziers	Solomon ben Joseph ben Job (Ayyub)	*Sefer ha-Hašvaʾah*	Ibn Janāḥ's *Kitāb al-taswiʾa*	388
End 12th cent.	Northern France	Obadiah ben Samuel ha-Sepharadi	*Sefer ha-Haśśagah*	Ibn Janāḥ's *Kitāb al-mustalḥaq*	389, 396
12th cent.	Mainz	anonymous	*Sefer Horayot ha-qoreʾ*	Abū al-Faraj Hārūn's *Hidāyat al-qāriʾ*	393, 395
12th	Italy	anonymous	*Token ʿEzraʾ* or *Ṭaʿamei ha-miqraʾ*	Abū al-Faraj Hārūn's *Hidāyat al-qāriʾ*	393
End 12th–beg. 13th cent.	Northern France or England	anonymous		Introduction of David ben Abraham al-Fāsī's *Kitāb jāmiʿ al-ʾalfāẓ* (attributed to Abraham ha-Bavli?)	388
1473	Granada	Saadia ben Maimon Ibn Danān	*Ha-Kelal ha-hekreḥi be-diqduq ha-lašon ha-ʿivrit*	His own *al-Ḍarūrī fī al lugha al-ʿibrāniyya*	411

Note: L = lexicography; G = grammar; GC = grammatical commentary; Ph/M = phonetics/Masorah; NA = not available: the work is known only through quotations.

other human sciences, such as theology, exegesis, jurisprudence, and philosophy; there was a fruitful exchange of linguistic ideas between Karaites and Rabbanites, and free use was made of the Arabic linguistic tradition as the chief model for the description of the Hebrew language.[4] In the early period of its development, linguistics did not meet with serious opposition even from those circles hostile in principle to "foreign" sciences.[5] Admittedly, in later periods, some scholars described disciplines such as grammar or medicine as a pure waste of time,[6] but most others considered it to be indispensable either for the correct interpretation of texts or as the very condition of human communication.[7] Medieval Hebrew linguistics was consequently an important and prolific discipline, building on and attesting to intellectual contacts with the non-Jewish environment. At the same time, this discipline claimed a role in the Jewish curriculum, in the light of its postulated primordial role for the interpretation of sacred texts.

Here I provide a general overview of the most important authors, achievements, ideas, and texts of the Hebrew grammatical tradition from its inception in the tenth and eleventh

4 On Arab influence on Hebrew grammar in general, see Bacher (1892), pp. 14–15; Téné (1971), col. 1353; Drory (1988), pp. 88–91.

5 We do find traces of some opposition to the study of grammar as a "foreign science" (see, e.g., Ibn Janāḥ's introduction to his *Kitāb al-Lumaʿ*), but this opposition did not seem to have any serious impact.

6 See Abraham Ibn Daūd in his *ʾEmunah ramah* II.45 quoted by Wolfson (1925), p. 314.

7 On the definitions of language as a tool for transmission and reception of knowledge, see Zwiep (1997), pp. 37–41.

centuries until the early sixteenth century, when Hebrew linguistics came to be studied and described chiefly in the Christian universities of Europe. This overview is accompanied by a list of essential bibliographical references.

Medieval Hebrew Linguistics: Definition and Aims

At the onset, we must define the scope of this overview with more precision. Indeed, reflections about language are always present in traditional Jewish literature. Many passages of the Bible, the early rabbinic literature, and commentaries are language oriented, follow some implicit method of word analysis, and contain various accounts of the origins and nature of language in general and of the Hebrew language in particular.[8] It was later, however, in the Gaonic period that the Hebrew language became an independent object of study. Some scholars hold that the invention of the vocalization system applied to the Hebrew Bible was a *sine qua non* for any linguistic analysis of Hebrew.[9] Nevertheless, the main stimulus for the birth and early development of this discipline was undoubtedly Arabic linguistics – a full-fledged scientific discipline since at least the eighth century, when comprehensive works were written, notably by Khalīl Ibn Aḥmad (the dictionary *Kitāb al-ʿAyin*[10]) and by his disciple, the grammarian of Persian origin, ʿAmr ibn ʿUthmān ibn Qanbar al-Basrī, known as Sībawayh, whose *al-Kitāb fī al-naḥw* (Grammar Book) was to become the most influential description of the Arabic language up to the present day. That Arabic grammar, of both the Kufa and Basra traditions, served as the model for the Hebrew grammarians can be seen from the structure, terminology, and general concepts used in the works on Hebrew, as well as from the fact that Arabic rather than Hebrew was the most frequent means of expression used by early Hebrew grammar. In several cases, large passages in the works of Jewish grammarians can be identified as paraphrases or direct adaptations from specific Arab grammarians, such as Ibn Sarāj, who was the main source for Abū al-Faraj Hārūn, or al-Zubaydī, the main source for Ibn Barūn.[11] This close dependence of Hebrew grammar on Arabic models implies that the development of Hebrew linguistics as we have it could only take place after Arabic was adopted as the vernacular of the Oriental Jews and also, more importantly, as the language of literary and scientific expression.[12] In this vein, here let us consider only specifically linguistic works that satisfy a number of defined criteria:

1. The medieval works under scrutiny should belong to the specific genre of scientific literature devoted to the systematic analysis of the Hebrew language.
2. Their internal structure must be based on a coherent grammatical system (even if it is different from that accepted today).
3. They must use a meta-language, with relevant technical terms coined or borrowed for the purpose of describing linguistic phenomena.
4. Their authors must display a disciplinary consciousness and identify themselves as members of a defined group of practitioners.

Medieval Arab grammarians strived to define the boundaries of their discipline and divided linguistic sciences into two broad fields: *ʿilm al-lugha*, that is, the science of language (i.e., lexicography), and *naḥw*, or grammar. This division was in principle followed by Hebrew

[8] Zwiep (1997), esp. pp. 17–20; Skoss (1932–3a), pp. 1–12. On the use of the grammatical term בשפה קמוצה in a poem by Qallir, see Fleischer (1972).
[9] See Téné (1971), col. 1353.
[10] See Talmon (1997).
[11] See Basal (2002), p. 114 (also see Basal 1998).
[12] See Drory (1988, 1992).

grammarians, who, from the tenth century onward, referred to grammar by the Hebrew term *diqduq*, borrowed from the masoretic literature.[13] It must be stressed, however, that linguistic works often dealt with both grammar and lexicography, and not necessarily with a clear-cut distinction. Dictionary entries often contain grammatical discussions, whereas grammatical treatises, such as the works of Ḥayyūj, may be arranged in alphabetical order, like a dictionary. The traditional division into grammar and lexicography, inherited from the Arabic grammatical tradition, does not account for the richness of literary genres: Hebrew linguistics also includes "the science of the correct reading of the Bible" (described later) as well as grammatical Bible commentaries, which include features of both lexicography and exegesis. Indeed, linguistics is difficult at times to distinguish from exegesis or philosophy. Commentaries in traditions far apart such as those of Saadia Gaon and Rashi contain explicit linguistic remarks and often quote recognizable grammatical concepts and works.[14] Dunash ben Tamim's commentary on *Sefer Yeṣirah*, written in Kairouan in the early tenth century, is not a work of linguistics,[15] but it does contain an elaborate discussion of the physiology and phonetic realization of speech.[16] Judah Halevi was not a grammarian, but his *Kuzari* contains one of the best-known discussions of the origins and nature of the language. He also counted future grammarians among his disciples.[17] As we shall see, the distinction is even more subtle with regard to the traditional text-critical discipline of the Masorah.

Nonetheless, from the tenth century onward, we have evidence of specifically grammatical works that satisfy the aforementioned criteria and allow us to consider Hebrew grammar to have emerged as a discipline in its own rights. Various medieval authors ascribed different roles to the study of grammar. One aim of this discipline was normative: to ensure the correct use of Hebrew.[18] Other aims, for more philosophically oriented scholars, were to serve as a foundation and introduction to other sciences[19] and to facilitate communication and the transmission of knowledge.[20] Nonetheless, the main function of grammar is to serve biblical interpretation, which in turn allows correct observance of the Law. Medieval sources portray grammar and exegesis as separate but related fields. Grammar is defined as an "auxiliary science," subservient to, but also absolutely indispensable for, exegesis. This was clearly expressed by the tenth-century Karaite lexicographer David ben Abraham al-Fāsī, in the introduction to his dictionary *Kitāb jāmiʿ al-ʾalfāẓ* (Collection of Words):

> It is incumbent upon anyone who proposes to write a commentary on the Bible that he be perspicacious in the Hebrew language, in the exact form of imperatives, the active and passive participles, the *maṣdars* (etc.); anyone contemplating to write some commentary on the books of the Scriptures should not be rash in his interpretations, but master first the grammatical rules, inflections, the causes for change of accents and the syntax of the language, as well as its correct use in speech.[21]

The early eleventh-century Karaite author Abū al-Faraj Hārūn Ibn al-Faraj devoted the first chapter of his *al-Kitāb al-kāfī fī al-lugha al ʿibrāniyya* (The Sufficient Book on the Hebrew

[13] Khan (2000a), p. 13.

[14] For Rashi's grammatical ideas, see Englander (1936, 1937–8, 1939); Pereira-Mendoza (1940); and Steiner (1998). For relationship between grammar and exegesis, see Dotan (2000).

[15] Dunash is said to have written a linguistic work on the comparison of Hebrew with Arabic, but it is lost today. See Del Valle Rodríguez (2002), p. 198.

[16] See Grossberg (1902) and Vajda (rev. and expanded by Fenton; 2002).

[17] See, e.g., Bacher (1891a). Solomon Ibn Parḥon is said to be Halevi's disciple (see subsequent text).

[18] See, e.g., the introduction to the *Maḥberet* of Menaḥem ben Saruq, ed. Sáenz-Badillos (1986), p. 1*.

[19] See Judah ibn Tibbon's introduction to his Hebrew translation of Ibn Janāḥ's grammar: "[Linguistics] is the beginning (ראש) of all the sciences and a ladder to all the upper levels," ed. Wilensky (1929, reedited with additions by Téné, 1964), I, p. ב.

[20] See Zwiep (1997), p. 37, on Joseph ben Judah ibn Aqnin and his curriculum of traditional Jewish education.

[21] Skoss (1936–45), Vol. 1, p. lxxviii.

Language) to the study of grammar. The three aims of this study, listed and illustrated with numerous examples, all focus on interpreting the Bible:

The purpose of this discipline is multifaceted. One purpose is to act as an aid to learn the commandments and know their correct meaning in the case of those for which erroneous interpretations have been offered. . . . A second purpose of the discipline is to act as an aid to distinguish among the various interpretations that are given for individual words those that are correct from those that are incorrect. . . . A third purpose of the discipline is to act as an aid to the knowledge of correct reading in many places where errors have been made in this respect.[22]

Elsewhere the same author made this statement:

The need to know the Hebrew language is related to the obligation of knowing the true expressions of the Lawgiver, may He be exalted. No one can achieve this knowledge while he is ignorant of the language, because he will certainly err and interpret falsely.[23]

Chronological and Geographical Framework

This definition of medieval Hebrew grammar as an independent science with its own methods and literary genres sets the lower chronological boundary of this overview. Although there may have been earlier attempts, and although some aspects are related to the achievements of the Masorah,[24] we cannot speak of Hebrew linguistics or grammar as such before very end of the century. This period, which witnessed the adoption of the Arabic language for Jewish scientific literature, is also the period of the earliest specifically grammatical texts known to us. The Rabbanite scholar Saadia ben Joseph, the Gaon of Sura (Fayyum, 882–Baghdad, 942), is usually portrayed as the founding father of Hebrew linguistics. In this, modern scholars follow Abraham Ibn Ezra, whose *Sefer Moʾzenei lešon ha-qodeš* placed Saadia Gaon at the head of the list of Hebrew grammarians.[25] In the wake of recent discoveries, however, we have become increasingly aware that there were well-established schools of Hebrew grammar in Babylonia contemporary with or before Saadia.[26] Saadia's grammatical thought thus belongs to one current – and probably not the main one – of the early Hebrew grammatical tradition. An important testimony to this effect is provided by the Karaite thinker Jacob al-Qirqisānī in his *Kitāb al-anwār wal-marāqib* (Book of Lights and Watchtowers), compiled in Baghdad in 937:

In our generation there is no longer a single man among those who occupy themselves with the science of language (*ʿilm al-lugha*) and grammar (*diqduq*) in Isfahan, Basra, Tustar and elsewhere, who would not accept the primacy and truth of the reading of Palestine, and who would not recognize that the true grammar can be based only on this tradition.[27]

While he establishes the validity and acceptance in Babylonia of the Tiberian reading tradition, al-Qirqisānī also gives us precious indications of the existence of schools of Hebrew grammar in various centers in Iraq and Iran.

The upper chronological limit of this overview is set at the beginning of the sixteenth century – the period when, as is often said, Hebrew grammar ceased to be a Jewish prerogative and became a part of the Christian university curriculum and thus of the European

[22] Khan, Gallego, and Olszowy-Schlanger (2003), Vol. 1, pp. 12–16.
[23] Ed. Hirschfeld (1922–3), p. 1.
[24] See Dotan (1990).
[25] Ed. Heidenheim (1791), f. 1b.
[26] On references to previous generations of Hebrew grammarians in the works of tenth- and eleventh-century Karaite authors, see Khan (1997), pp. 316 and 320.
[27] *Kitāb al-anwār* II.15–16, ed. Nemoy (1939–45), pp. 135–8.

humanistic heritage.[28] Although Christian scholars had studied Hebrew and contributed to Hebrew linguistics long before that time, and Jewish scholars continued to study and write on grammar and lexicography, the beginning of the sixteenth century marks a convenient and coherent end to medieval Hebrew linguistics.

Periodization of the History of Medieval Hebrew Linguistics

In his comprehensive and influential general survey, published in 1971 in the *Encyclopaedia Judaica*, David Téné proposed a fourfold periodization of the history of medieval Hebrew linguistics: initial attempts (Period I), creativity (Period II), dissemination (Period III), and "standstill" (Period IV).[29] According to Téné, the time of first attempts extends from the beginning of the linguistic literature until the end of the tenth century, the period of creativity is essentially the eleventh and early twelfth centuries, the period of dissemination began with the migration of Spanish scholars to southern France and Italy after 1148 and ended with David Qimḥi's *Mik̲lol* (1205), and the fourth period lasted until the sixteenth century, when Hebrew grammar was taken over by Christian Hebraists.[30]

Such a distinction between periods of creation and of dissemination may have its didactic merits, but it also suffers from oversimplification. In many cases, both the original creativity of the early period and its absence in the later period seem to be exaggerated. Indeed, the main aim of the tenth- and eleventh-century authors was to provide a coherent system of description for the Hebrew language echoing the description of Arabic (see Table 19.1). With a few exceptions in the field of lexicography, the Hebrew grammatical literature was written in Arabic and closely followed the terminology and methodology of Arab grammarians. As we shall see, some grammatical works, especially those of the eleventh century, evince a strong dependence on specific Arab grammarians, to the extent that entire sections of Arabic grammatical works were simply copied by Hebrew grammarians, whose creativity was limited to changing Arabic examples into examples in biblical Hebrew and finding a correspondence between Arabic and Hebrew expressions of the same grammatical rule. Although there are also obvious cases of originality and independence of Arabic models, it can be rightly argued that, from the point of view of form and method, Hebrew linguistics of that time could be described as belonging to the Arabic linguistic tradition, transferred and adapted to a non-Arabic language.

In later periods, the Hebrew linguistic literature is usually in Hebrew (see Table 19.2). It obviously builds on the achievements of the earliest grammarians: The theory of "radical" and "servile" letters, the rules of word derivation, and interpretation through the permutation, exchange, elision, or addition of consonants remained almost unchanged. It is true that none of the later works proposes "a revolution" like that worked by Ḥayyūj or an alternative comprehensive system of verb description like that proposed by Abū al-Faraj Hārūn (see later text). Nonetheless, the later Hebrew linguistic literature can also boast of original ideas and interpretations as well as original arrangements and presentation of grammatical and lexicographical material. It is also relatively open to new sources of influence, namely the Latin grammatical tradition: There are Hebrew translations of Donatus,[31] and the influence of speculative grammar has been claimed for Profiat Duran and Abraham de Balmes.

Therefore, in this chapter, I do not follow the fourfold, division and instead I divide the discussion into two parts. The first deals with the so-called formative period of the

[28] For an overview of Christian Hebraism in the Renaissance, see Kessler-Mesguich (2000).
[29] Téné (1971).
[30] Ibid., col. 1355.
[31] Rothschild (2001, 2003).

"grammatization" of Hebrew, in close relationship with the Arabic linguistic tradition (roughly the tenth and eleventh centuries). The second concerns the period of the final adoption of Hebrew linguistics as a branch of Hebrew scientific literature, whether through translations from Arabic or the composition of original works (roughly from the end of the eleventh to the beginning of the sixteenth century). Naturally, the first part concerns mainly (but not exclusively) Oriental and Spanish authors and works, whereas the second part focuses on Western and northern Europe and Byzantium. It must be stressed that this division is not intended to reflect a distinction between "pioneers" and "copiers and epigones"; each period had its own (more or less) original and creative aspects. Rather, my aim is to highlight the changing objectives and usages of grammar in medieval times (for example, scientific and theoretical description vs. pedagogical tools) and to focus on the transmission of grammatical ideas through the identification of various sources and manuscripts.

THE FORMATIVE PERIOD: AN OVERVIEW

The tenth and eleventh centuries are the period of the grammatization of the Hebrew language par excellence.[32] This period witnessed major attempts to create coherent systems of description applicable to the Hebrew language as a whole. Drawing their inspiration from Arabic linguistics as well as from the native masoretic tradition, the Hebrew grammarians of this early period endeavored to establish normative sets of grammatical rules, which had never existed in the Hebrew tradition. They operated within the intellectual and literary framework of the rationalist linguistic approaches prevalent among Arab grammarians, who were increasingly drawn to Aristotelian logic from the tenth century onward. These Hebrew grammarians, who were particularly interested in defining grammatical categories, chose Arabic as the language for their works. From the outset, Jewish authors adopted the division into three parts of speech (noun, verb, and particle), and they provided various theoretical definitions.[33] They established the fundamental differentiation between the base of a word and the additional elements whose adjunction, according to the rules of grammatical analogy, allows inflection and word derivation. As we shall see, at that early stage, there was no agreement on the precise nature of this "derivational base." For some Jewish authors, it was an existing form attested in the language: a noun for Saadia Gaon, an infinitive for Abū al-Faraj Hārūn. For others, it was a theoretical entity underlying the actual linguistic realization: an "essence" (*jawhar*) for Ibn Nūḥ, the abstract "root," which could be composed of a varying number of consonants (Menaḥem ben Saruq) or of precisely three consonants (Judah Ḥayyūj). Regardless of these variations, however, the distinction between the base and its additions is essential for the existence of grammar as such. This grammatical distinction overlaps and takes over a more ancient approach, attested in masoretic tractates such as *Diqduqei ṭeʿamim* and accepted by most later grammarians, which classifies the letters of the Hebrew alphabet according to their capacity to be part of the "derivational base" (יסוד) only or to serve as grammatical additions as well (the "servile letters" or משרתים).[34] The distinction between the derivational base and the additional elements is essential for the elaboration

[32] The term "grammatization" was proposed by S. Auroux (1994) in his study of the use of classical grammar to describe vernacular languages in the Renaissance. The development of the early Hebrew grammar and especially the application of Arabic grammatical descriptions to Hebrew are analogous to this later Renaissance phenomenon.

[33] See, e.g., Fischer (1962–3).

[34] Medieval grammarians listed the "basic" and "servile" consonants in mnemotechnic formulas. For a general discussion of the formulas, see, e.g., Kaufmann (1888). See also Klar, ed. (1947), pp. 7–8.

of morphological paradigms, which take different form according to the Hebrew linguistic approach taken by their authors.

The following paragraphs describe various attempts by Oriental and Spanish scholars to offer a consistent description of the Hebrew language and to elaborate systems of coherent grammatical rules. This presentation deals successively with grammar, lexicography, and "guides to the correct reading of the Bible." The strict division among these categories is sometimes artificial, because they are interrelated; notably, grammatical concepts necessarily underlie any lexicographical arrangement. The order in which these branches are described here is not chronological: The earliest known glossaries and dictionaries predate grammars by a few decades both in the Orient and in Spain; the "guides" have their roots in the more ancient discipline of the Masorah. However, an understanding of the grammatical concepts appears to be essential for understanding the other aspects of linguistic science.

During this formative period, there were two different schools of Hebrew grammar: the Oriental and the Western (Spanish) traditions. Early on, in the eleventh century, Jewish scholars in northern Europe and in Italy, too, displayed a considerable interest in grammatical studies, but they focused on talmudic lexicography and remained under either Oriental or Spanish influence in their grammatical approaches.[35]

The Oriental school began probably in Iraq, under the influence of the Arabic schools of Kufa and Basra, and then spread to Palestine and later, in the eleventh century, to Byzantium. This school elaborated distinctive methods of linguistic analysis. Beyond individual differences among authors, the Oriental school can be defined by certain common characteristics, such as the absence of the notion of an abstract consonantal root as the derivational base and of verb "conjugations" or stems (*binyanim*). The Oriental school was represented by the Rabbanite Saadia Gaon and by a considerable number of Karaite grammarians as well.

Almost at the same time, linguistics developed in North Africa and Spain, too. At first heavily indebted to the Oriental tradition, the Spanish school began elaborating a distinctive system of grammatical description as early as the beginning of the eleventh century. The main figure of this period was Judah Ḥayyūj. His system, after a period of polemics and discussions, was generally accepted and applied by almost all Hebrew grammarians. This system is still in use today; the rules of analogical derivation of words from abstract consonantal roots and the coherent system of verbal stems (*binyanim*) are the only way we think of Hebrew grammar today. As for the Oriental school, following its initial period of dynamic creativity, it gradually declined and fell into oblivion. Although, as we shall see later, the most important works of this school were still copied and studied as late as the fourteenth century, by the early twelfth century Ḥayyūj's system was the norm.

Grammar

The Oriental School. As noted, it appears that various centers of Hebrew grammar existed in Iran and Iraq in the early tenth century. Nevertheless, the earliest grammatical texts whose author can be identified are those by Saadia Gaon. Besides his numerous works of exegesis, jurisprudence, liturgy, and philosophy, Saadia wrote several monographs on various aspects of the Hebrew language. His work dealing with grammar and grammatical theory is the *Kitāb faṣīḥ lughat al-ʿibrāniyyn* (The Book of Elegance of the Language of the Hebrews), probably written during the second or third decade of the tenth century.[36] Seven manuscripts of this work are known to us and were used for the recent critical edition and in-depth study.[37]

[35] For a general presentation of the Ashkenazi grammatical tradition, see Eldar (1978–9).
[36] Dotan (1997), Vol. 1, p. 33.
[37] Ibid. For previous editions, see Harkavy (1906); Skoss (1932–3b, 1942–3, 1951–2, 1952, 1955).

The shorter version, entitled *Kitāb naḥw al ʿibrānī* (Book of Hebrew Grammar), has been preserved in several fragments in the Cairo Geniza.[38]

The *Kitāb faṣīḥ* originally contained twelve chapters, of which only eight have survived. Its main subjects are what today would be called phonetics, phonology, and vocalization, but discussions of morphology are also present throughout. Only the third chapter, on inflection (*taṣrīf*),[39] contains a short but comprehensive treatment of exclusively grammatical topics. This chapter, together with some additional information scattered in other parts of the book, allows us to reconstruct Saadia's original grammatical system as well as his universalist approach to the origin and nature of language.[40]

Following the Arab grammarians (themselves influenced in this respect by the Aristotelian tradition), Saadia distinguishes and defines three parts of speech: noun (*ʾism*), verb (*kalima*), and particle (*ḥarf*).[41] He divides the noun category into substantives (*jawhar* or "essence"), which can be common nouns (e.g., *zeraʿ*) or proper names (e.g., *ʾAvraham*), and action nouns (*ʿaraḍ* or "accident"), like *davar* and *ḥefeṣ*, including the *maṣdar*, by which he means verbal nouns. The uninflected singular form of a noun is considered to be the derivational base (or origin, *ʾaṣl*), from which secondary forms (i.e., verbs[42]) are coined by morphological derivation. This derivation can be achieved in several ways: the addition of morphologically distinct affixes (*lawāḥiq*), of semantic categories (e.g., by addition of the temporal dimension, such as when דָּבָר becomes אדַבֵּר), or both; by elision of a consonant with a replacement (e.g., מִקְרָא becomes יִקְרָא); by vowel substitution (e.g., שֵׁמַע* becomes שָׁמַע); and by analogy (*qiyās*) with attested forms of different words (e.g., the unattested form of the verb שמע in the verbal paradigms in chapter 3). The derivational base (*ʾaṣl*) is therefore an actual word, preferably attested in the Bible. However, in some cases an *ʾaṣl* that is not attested in the Bible can be reconstructed from existing secondary forms by analogy with other words.[43]

The three parts of speech are described by Saadia according to their capacity to be constructed by using these "additions." Nouns can take eleven additions. Seven apply to all nouns and do not change the vocalization: מ, ל, כ, ו, ה, ב, and ש. Action nouns accept four further additions, אינת, which change the vocalization and "transform the noun into a verb" (אֲדַבֵּר>דָבָר). Nouns and verbs accept the addition of ten personal pronouns (nouns accept possessive suffixes; verbs accept object suffixes). Verbs accept ו, ה, and ש, as well as "time": The verb can be past, present, and future. It is important to stress that for Saadia the addition of time does not reside in the morphologically distinct affixes; for instance the prefixes אינת are not described as particles of the future tense of the verb as such, but as additions that transform the noun into a verb. Without them the verb would not exist.[44] Forms like ועשיתי are described as having three additions: ו ("and"), אני ("I"), and the "addition of time," although these three additions correspond to only two morphologically distinct affixes.[45]

Thus, Saadia's additions are partly morphological and partly semantic. In other words, the number of additions in Saadia's description does not correspond to the actual number of morphologically distinct prefixes or suffixes, but rather to their different functions. It is

[38] Eldar (1981); Allony (1981). Eldar suggests that the author of this abridgment might be identical with a certain Ibn Shaʿadān, whose *Mukhtaṣar* is mentioned in a booklist from the Cairo Geniza; see Eldar (1981), p. 107.

[39] Most of this chapter was added as an afterthought at the request of some unnamed disciples; see Dotan (1997), Vol. 1, p. 52.

[40] On Saadia's linguistic universalism, see Dotan (1999), p. 27.

[41] Dotan (1997), Vol. 2, p. 339.

[42] In his opinion that *maṣdar* is the derivational base of the verb, Saadia follows the Basran school of Arabic grammar; see Goldenberg (1973), p. 280; Eldar (1998a), p. 51.

[43] See Eldar (1998a), p. 54, who quotes here the Basran principle of "return to *aṣl*."

[44] Dotan (1997), Vol. 1, p. 195.

[45] Ibid.

evident also from his analysis of forms such as והאכלתיך or "and I fed you," which has five additions: (1) ו; (2) the agent (first-person singular, "I"); (3) time (past); (4) a direct object or patient (second-person masculine singular, "you"); and (5) an object-agent (second-person masculine singular, "you"): "I feed you," therefore you eat; "you" is both a passive recipient of the action and the agent of a (different) action.[46] Such a form is different from a form like ועזרתיך or "and I helped you," which in Saadia's system has only four additions: (1) ו; (2) the agent אני (first-person singular, "I"); (3) "time" (past); and (4) an object (second-person masculine singular, "you"). That is, Saadia describes the notion of causality in forms of what we call the *hiphʿil* as related to the meaning of the words rather than as dependent on the morphological prefix ה. Indeed, Saadia's division of verbs into two groups is based on similar criteria: (1) verbs with an object that is itself the agent-subject of another action (e.g., השמעתיך, or "I made you hear, so you listen") and (2) verbs with object (שמרתיך or "I kept you").[47] For causal verbs like השמיע, Saadia does not describe the ה as an addition and certainly not as an addition expressing causality.[48]

After his discussion of which additions can be accepted by a given part of speech, Saadia divides all words into five groups, according to the maximum number of additions a word can have at the same time: (1) words that can accept one addition only, such as ואברהם or "and Abraham"; (2) words that can accept two additions, such as בקולי or "to my voice" (ב and first-person singular, "I"); (3) words that can accept three additions, such as ועשיתי or "and I made" (ו, first-person singular, "I," and the "time"); (4) words that can accept four additions, such as ועזרתיך or "and I helped you" (ו, first-person singular, "I," "you-object/patient," and "time"); and (5) words that can accept five additions, such as והאכלתיך or "and I fed you" (ו, first-person singular, "I," "you-object/patient," "time," and "you-agent").[49] Then Saadia shows how a large number of different forms can be derived from the parts of speech according to these principles. Every proper noun can have thirteen additions: the seven letters מ, ל, כ, ו, ה, ב, and ש, each of which (except for ו) can be preceded by a ו. Every common noun and action noun can have, in addition to these 13 forms and the same number for the plural, another 260 forms when these 26 forms are combined with the ten possessive suffixes. Each verb can have 160 forms: 4 forms: ו, ה and ש, and ו before ש, plus ten objects suffixes for each form, plus another 40 forms for causal verbs, plus the corresponding 80 forms for the future (in addition to the forms without suffixes).

An important element of Saadia's grammatical chapter is the table of verb paradigms.[50] Probably because of its frequency in the Bible and despite the difficulty caused by the final guttural consonant,[51] Saadia chose the verb שמע as his model and listed all its possible forms, beginning with the first-person singular, past tense, "intransitive" (in Saadia's words *li-ḍātihi* or "for itself") שמעתי, followed by its equivalent in the "transitive" (or rather causal) form (*li-ghayri-ḍātihi* or "for another"), the future of both forms, and the corresponding four forms of the first-person plural, and so on for the other persons. Then he lists all the forms with object suffixes. Each form is translated into Arabic. Forms of the verb שמע that are not attested in the Bible are derived by analogy from other verbs.[52]

Thus Saadia offers a comprehensive description of the Hebrew language in which action nouns are the derivational base for verbs (the principle he used in his lexicographical work,

[46] Ibid., p. 196.
[47] Ibid., p. 195.
[48] See Dotan (1997), Vol. 2, p. 349.
[49] Ibid., p. 351.
[50] Skoss (1942–3), pp. 174, 184; Skoss (1955), pp. 19, 38; Goldenberg (1979).
[51] See Goldenberg (1991).
[52] Dotan (1997), Vol. 2, pp. 359–87.

discussed later), parts of speech are defined, and words are assigned to categories according to their capacity to take the so-called additions.

Saadia Gaon appears to be the only early Rabbanite grammarian of the Oriental school. Aside from him, in the tenth and early eleventh centuries, the Oriental school was dominated by Karaites. This is not to say that these scholars' approach to Hebrew grammar was specifically "Karaite." The theory of grammar attested in their works seems to constitute the mainstream of the early Oriental tradition, whose beginnings (Karaite or Rabbanite) are unknown today and probably go back to the ninth century.[53] The Karaite majority among Hebrew grammarians of the Oriental school is probably due to the importance the group attached to the study of Hebrew and its correct use and to the role of grammar in its literal interpretation of the Bible.[54]

The earliest Karaite grammatical works date from the tenth century. The most important of them is undoubtedly the *Diqduq* of Abū Yaʿqūb Yūsuf Ibn Nūḥ (Joseph ben Noaḥ; tenth to early eleventh century, Iraq and Palestine), described by the fifteenth-century chronicler Ibn al-Hītī as the founder of the Karaite Academy in Jerusalem.[55] The *Diqduq* was long considered to be lost, until several manuscripts, some dating from the author's time, were recently identified in the Firkovich and Geniza collections by G. Khan.[56] The *Diqduq* was influential in Karaite circles and was reedited in an abridged form, which is also preserved in Geniza fragments.

The *Diqduq* is not a systematic description of specific grammatical topics in separate chapters or sections, nor does it contain lengthy theoretical discussions or definitions of linguistic categories. It is, rather, a grammatical commentary on the Bible, which follows the order of the biblical text and focuses on the grammatical difficulties encountered in a series of unrelated short discussions and comments (*masāʾil*). Each Hebrew lemma is provided with an Arabic translation followed by a comment. Ibn Nūḥ's main concern is parsing the words, establishing their precise structure and their derivational base, and defining rules of word formation. He believes that the form of a word determines its precise meaning; hence the morphological structure is reflected as closely as possible in the Arabic translation.

Ibn Nūḥ does not define the parts of speech and refers explicitly only to the noun (as *ʾism*). However, it is evident from his comments that he also accepts the tripartite division into noun, verb, and particle, even though he refers to the latter two simply as "word" (*kalima*, which Saadia used more specifically for "verb").[57] The actual words are forms derived by a morphological process (*taṣrīfāt*) from a derivational base (*ʾaṣl*); the derived forms maintain a close structural relationship with the derivational base. The *ʾaṣl* is a real vocalized form (*lafẓ*) that is or could be attested in the language (or rather in the Bible, because Ibn Nūḥ deals specifically with biblical Hebrew). Unlike Saadia Gaon, for whom the *ʾaṣl* was invariably a noun, in Ibn Nūḥ's system, the *ʾaṣl* can belong to various grammatical categories and forms. The most frequent derivational base of both verbal and nominal forms is an imperative. In the priority given to the imperative, Ibn Nūḥ probably follows the Arabic tradition of the ancient school of Kufa.[58] Many nouns and some verbs are derived from a noun. For

53 Khan (2000a), pp. 21–5.

54 Drory (1988); Olszowy-Schlanger (1997); Gallego (2003).

55 See Margoliouth (1897), p. 433.

56 Khan (1999, 2000a). The existence of the *Diqduq* was known from the quotations in the works of Abū al-Faraj Hārūn; see Bacher (1895), p. 251. Several leaves of the *Diqduq* were discovered in Cambridge and Oxford Geniza collections and published (Becker 1986–7) as an anonymous Karaite grammar. The discovery by G. Khan of a number of manuscripts, some with preserved colophons, in the Firkovich collections in St. Petersburg made it possible to correctly identify the Geniza fragments previously published by Becker. See Khan (1998).

57 Khan (2000a), pp. 39, 74.

58 Khan (1997), p. 324.

example, בּשְׁתִּי or "I am ashamed" (Ezra 9:6) is said to be a noun בּשׁ, to which the verbal ending תי is added; תִּשְׁמוּרֵם or "will protect them" (Prov. 14:3) is said to be derived from the noun שְׁמוֹר, because "the prefixes אינת may be attached to nouns" (a derivation parallel to that described by Saadia Gaon).[59] In a few cases, an infinitive or even a past-tense verb is said to be a derivational base.[60]

Although the derivational base is always a word belonging to one of the grammatical categories, it does not have to be actually attested in the language. If no base similar in structure to the derived word can be found, Ibn Nūḥ coins a hypothetical form by analogy with attested forms (or according to the pattern called *wazn*: a set number of consonants with a specific structure of syllables and vowels). These hypothetical forms are not proposed as a device to create new words to enrich the Hebrew lexicon (unlike Saadia Gaon, who coined neologisms for poetry), but serve as purely technical means of grammatical description. For example, the passive verb forms (the *puʿal* and *hophʿal* in modern terminology) do not have imperatives, but Ibn Nūḥ creates them to obtain a structurally compatible derivation base for these verbs (e.g., רֻקַּמְתִּי is derived, according to him, from a hypothetical imperative רֻקַּם*).[61]

Of course, as already noted, Ibn Nūḥ did not use the concept of verbal stems or *binyanim*, which was introduced a decade or so later by Ḥayyūj in Spain. Unlike Saadia, however, who concentrated on simple and causal verbs (corresponding to the *qal* and *hiphʿil*), Ibn Nūḥ implicitly recognized the relationship between different verb "stems." As G. Khan has observed, the proposed derivational base and the form said to be derived from it always belong to the same stem: In modern terms, the *qal* imperative is the derivational base for *qal* verbs, the *piʿel* imperative for *piʿel* verbs, and so on. Ibn Nūḥ also recognizes a relationship among forms of the same verb (or root, to use modern terminology) in different stems. This relationship follows from his concept of "primary imperative" (*al-ʾamr al-ʾawwal*) and "secondary imperative" (*al-ʾamr al-thānī*).

In some cases an imperative that is an immediate derivational base for a verbal form is itself derived from another imperative (a primary imperative); for example, the immediate derivational base (not attested) of מְיֻדָּעִי or "my friend" (Ps. 55:15) is the imperative יֻדַּע* or יֻדֵּע* (same pattern as שֻׁלַּח and the secondary imperative מְשֻׁלָּח), but its primary imperative is יַדַּע* (like שַׁלַּח). To "translate" this example into modern terminology, the *puʿal* form is derived from a theoretical *puʿal* imperative, which in turn derives from a *piʿel* imperative. Indeed, from information scattered through Ibn Nūḥ's works, Khan has established that the *qal* imperative is always the primary imperative for the *niphʿal* imperative, the *piʿel* for the *hitpaʿel* and *puʿal*, and the *hiphʿil* for the *hophʿal*.[62]

Thus, although there is no theoretical discussion of the *binyanim* in the *Diqduq*, Ibn Nūḥ was aware of the existence of regular verb patterns and their relationship. He was also aware of an underlying abstract essence of the words, corresponding to Ḥayyūj's consonantal root. Indeed, in many places in the *Diqduq*, Ibn Nūḥ refers to the essence or *jawhar*, which he sometimes confusingly calls *ʾaṣl al-kalima* or "derivational base of the word." Although the derivational base (*ʾaṣl*) is a word, the *jawhar* is a word core that does not occur in the language as such and consists only of consonants.[63] Moreover, some of the consonants that occur in the derivational base are not part of the *jawhar*, such as the initial *mem* in מָקוֹם and the feminine ending of nouns. In some cases, a consonant of the *jawhar* is not

59 Khan (2000a), pp. 56, 429. On the question of Saadia's influence on early Karaite grammarians, see Eldar (1994), p. 14; Khan (2001b), pp. 90–1.

60 Khan (2000a), p. 39.

61 Ibid., p. 43.

62 Ibid., pp. 54–5.

63 See Khan (1998), pp. 274–5; (2000a), pp. 74–8; Olszowy-Schlanger (1999a), p. 118. Saadia uses the term *jawhar* or "essence" with reference to the noun; see supra and Goldenberg (1973), p. 275; Dotan (1997), Vol. 1, p. 160.

visible in all the inflected forms; for example, the underlying *jawhar* of the imperative הָשֵׁב contains a *yod*. According to Ibn Nūḥ, a *jawhar* can be composed of one, two, or three consonants; for example, the *jawhar* underlying the *ʾaṣl* תְּלֵה consists of *tav* and *lamed* only.[64] The philosophical concept of the abstract essence underlying real words is well attested in early Hebrew lexicography and Karaite exegesis, but prior to Ḥayyuj its use as a grammatical concept is restricted to Ibn Nūḥ and a circle of early Karaite grammarians.

It is important to stress, however, that the grammatical approach represented by Ibn Nūḥ and his circle may reflect an even earlier tradition from Babylonia. Indeed, Ibn Nūḥ himself mentions other grammarians (although not by name), some of them apparently his contemporaries and others his predecessors.[65] Similar to the *Diqduq* in its methods, structure, grammatical theories, and terminology is an anonymous grammatical commentary in Judeo-Persian, five fragments of which (all from the same manuscript) were identified in the Geniza collection in Cambridge.[66] The same grammatical tradition is reflected in an early Karaite work on verbs, preserved in two manuscripts.[67] This work, which contains verbal paradigms, quotes a certain Saʿīd, who may be identical with the grammarian Saʿīd Shīrān, mentioned as a contemporary of Ibn Nūḥ's.[68] Another anonymous text, related to both the *Diqduq* and Saʿīd's treatise on verbs, is a work on Hebrew nouns found in several manuscripts in the Firkovich and Cairo Geniza collections.[69] Other tenth-century Karaite grammatical works are mentioned in medieval sources but have yet to be identified. Chief among them is the *Diqduq* of Yūsuf ben Bakhtawaya, unless we follow Khan in believing that this author is identical with Ibn Nūḥ.[70] Another Karaite scholar, Sahl ben Maṣliaḥ, is mentioned as the author of a grammar by the twelfth-century Byzantine Karaite Judah Hadassi, but the work itself seems to be lost.[71]

The end of the tenth and start of the eleventh century is an important moment in the Hebrew grammatical tradition. That is when the first successful attempts were made to describe the Hebrew language in an accomplished system of coherent rules, in both Spain and the Orient. It is well known that Judah Ḥayyūj in Spain proposed an efficient system of classification and derivation of Hebrew verbs. Ḥayyūj's works soon reached the Orient; his name was mentioned by the Jerusalem Karaite Abū al-Faraj Hārūn Ibn al-Faraj in his *Kitāb al-mushtamil*[72] and *Hidāyat al-qāriʾ*.[73] However, Ḥayyūj's methods were not immediately accepted. Instead, Oriental grammarians proposed alternative systems for the classification and derivation of Hebrew verbs.

The work of Abū al-Faraj Hārūn, in the Orient, constitutes a turning point for the grammatical tradition. Abū al-Faraj Hārūn, Ibn Nūḥ's successor as head of the Karaite Academy in Jerusalem,[74] appears to be the most prolific and widely read early medieval grammarian of the Oriental school. He wrote numerous works covering all areas of Hebrew grammar, vocalization, and lexicography. His most complete and detailed grammatical treatise is *Kitāb al-mushtamil ʿalā al-ʾuṣūl wa-l-fuṣūl fī al-lugha al-ʿibrāniyya* (The Comprehensive Book on General Principles and Particular Rules of the Hebrew Language), completed in 1026, which is

64 Khan (2000a), p. 76.
65 Ibid., p. 9.
66 Khan (2000b), pp. 241–331.
67 Ibid., pp. 13–178.
68 Ibid., p. 17.
69 Ibid., pp. 175–240.
70 See Khan (2002b), p. 2.
71 Hadassi, *Eškol ka-kofer* 167, letter ש; 173, letter צ.
72 See Skoss (1927–8), p. 18.
73 See Busi (1984), pp. 20–1.
74 According to the fifteenth-century chronicle by Ibn al-Hītī, ed. Margoliouth (1897), pp. 433, 438–9.

preserved in at least eight manuscripts, but which has yet to appear in a critical edition.[75] Its eight chapters deal comprehensively with Hebrew morphology, syntax, semantics, and lexicography. The author's own abridgment of the *Kitāb al-Mushtamil*, the *Kitāb al-Kāfī fī al-lugha al-ʿibrāniyya* (The Sufficient Book on the Hebrew Language) runs to no fewer than five hundred manuscript folios. A still shorter version, *al-Mukhtaṣar* (The Abridgment), is known to us in more than eighty manuscripts and fragments.[76]

Evidence of the popularity of the work is provided by this impressive number of extant manuscripts as well as their chronological span: They were copied between 1037 – the date in the colophon of a manuscript in Arabic script that is most probably the autograph (it belonged to Abū al-Faraj Hārūn's two sons Faraj and Judah[77]) – and the late fourteenth century.[78] He wrote a short introduction to grammar, the *Kitāb al-Madkhal ʾila ʿilm al-diqduq fī ṭuruq al-lugha al-ʿibrāniyya* (Book of Introduction to the Discipline of Careful Investigation of the Ways of the Hebrew Language), seven manuscripts that have recently been identified,[79] a commentary on the Pentateuch (based on Ibn Nūḥ's), the biblical glossary *Tafsīr al-ʾalfāẓ al-ṣaʿaba* (Interpretation of Difficult Words, which I describe in the section on lexicography), and the *Hidāyat al-qāriʾ* (Guide for the Reader; see my subsequent text). A shorter treatise on verbs based on the *Kitāb al-Kāfī*, and containing more than one hundred manuscript folios, *Kitāb al-ʿUqūd fī taṣārīf al-lugha al-ʿibrāniyya* (Book of the Details on the Inflection of the Hebrew Language) was also attributed to Abū al-Faraj Hārūn,[80] but recent research by Nadia Vidro has shown that it was written by an anonymous disciple of Abū al-Faraj Hārūn's, the "second grammarian of Jerusalem." Vidro has identified eight manuscripts and Genizah fragments of the *Kitāb al-ʿUqūd*, in addition to the already known unique fragment published by Hirschfeld.[81]

Abū al-Faraj Hārūn is the first Hebrew grammarian of the Oriental school to have adopted the Basran tradition of Arabic grammar as his model, notably by accepting the *maṣdar* (which for him meant the infinitive) as the derivational base for inflected forms of verbs (again an actually attested word rather than an abstract skeleton of consonants). In some respects, however, he was indebted to the old Oriental school represented by his Karaite predecessors.

This indebtedness to the earlier tradition is notably evident in Abū al-Faraj Hārūn's system of verbal patterns (*ʿalāmāt*). As previously stated, rather than accepting Ḥayyūj's system of *binyanim* (which he might have known), Abū al-Faraj Hārūn categorized verbs according to a system of patterns or quasi-mathematical formulas that he explained in detail in the *Kitāb al-Kāfī*.[82] Verbs are classified according to the principle of analogy applied to their syllabic structure: In a group of different words belonging to the same pattern, the consonants change, but the vowels and syllabic structure remain the same. Abū al-Faraj Hārūn classified all verbs into seven main categories, each described by an *ʿalāma*, a symbol or formula for a verb: The first syllable of the formula receives the vowel of the initial syllable of the second-person masculine singular of the imperative, and its second syllable receives the vowel of

75 Short extracts of the *Kitāb al-Mushtamil* were edited by Bacher (1895, pp. 232–56); several studies of various aspects of the work have recently been published by Maman (1996a, 1996b, 1997, 2001, 2002 [on lexicography]) and Basal (1998, 1999, 2001a, 2002). See Poznanski (1896). A critical edition is being prepared by A. Maman.

76 See Zislin (1962, 1963, 1964); Allony (1983); Becker (1991); Khan (1997); Basal (1997); and the complete critical edition of the work, by Khan, Gallego, and Olszowy-Schlanger (2003).

77 MS II Firk. Ev. Arab. I 4601; see Khan, Gallego, and Olszowy-Schlanger (2003), Vol. 1, pp. xlix–l.

78 For the list of manuscripts of the *Kitāb al-Kāfī*, see Khan, Gallego, and Olszowy-Schlanger (2003), Vol. 2, pp. 1056–7; for the manuscripts of the abridgments, see Khan, Gallego, and Olszowy-Schlanger (2003), Vol. 1, p. xii. For the manuscript transmission, see Gallego (2001).

79 See Khan, Gallego, and Olszowy-Schlanger (2003), Vol. 1, pp. xiii.

80 Hirschfeld (1922–3).

81 Vidro, 2009.

82 *Kitāb al-Kāfī* I.22; see Khan, Gallego, and Olszowy-Schlanger (2003), Vol. 1, pp. 176–207.

the initial syllable of the third-person masculine singular perfect. For instance, the first category has the formula הָבֵא: To this category belong verbs such as הָשֵׁב (imperative) and הֵשִׁיב (perfect), as well as בָּרֵךְ (imperative) and בֵּרַךְ (perfect) – verbs that in Ḥayyūj's system are classified as belonging to different *binyanim* (*hiphʿil* and *piʿel*) and different groups (a hollow weak verb and a sound verb). Although this system of *ʿalāmāt* seems convoluted to our Ḥayyūj-trained mind, there is no question that it constituted an interesting alternative attempt to classify all verbs into coherent categories based on analogy.

The destruction of the Karaite center of learning in Jerusalem by the Crusaders put a stop to the prolific grammatical creativity among the Karaites. Abū al-Faraj Hārūn remained nonetheless influential: His manuscripts were copied many times in the following centuries, and his works served as a model for other grammarians. Several manuscripts of unfortunately anonymous works quote Abū al-Faraj and follow and develop his ideas.[83] His books circulated in Spain and were notably quoted by Ibn Janāḥ, Judah ibn Balʿam, Moses ibn Ezra, and Abraham ibn Ezra, albeit with no mention of the author by name.[84] However, the system of *ʿalāmāt* itself fell rapidly into oblivion. It was used and even expanded by the anonymous eleventh-century Byzantine Karaite author of the Hebrew grammatical treatise *Meʾor ʿayin*,[85] but later Karaite grammarians in Byzantium, and notably Judah Hadassi in his *ʾEškol ha-kofer* (Cluster of Henna), written in 1148, accepted Ḥayyūj's system of *binyanim*.

The Spanish School. Abū Zakariyyā Yaḥyā Ibn Daʾūd (Judah) Ḥayyūj (d. ca. 1010), probably originally from North Africa, is not only the first known author of a grammatical work (as distinct from lexicography, attested several decades earlier) in the West, but also the one who had the most lasting impact on the Hebrew grammatical tradition. Probably a disciple of the lexicographer Menaḥem ben Saruq, he wrote four books on the Hebrew language: *Kitāb al tanqīṭ* (On Punctuation),[86] *Kitāb al-ʾafāl ḍawāt ḥurūf al-lin* (On Verbs Containing Weak Consonants),[87] *Kitāb al-ʾafāl ḍawāt al-mithlayyin* (On Geminated Verbs),[88] and *Kitāb al-nutaf* (Collection).[89] The last named, like the *Diqduq* of Ibn Nūḥ, belongs to the genre of grammatical commentaries on the Bible, but it follows Ḥayyūj's own grammatical system.

This remarkable system of description of Hebrew morphology (itself much influenced by the Arab grammatical tradition as practiced in contemporary Cordoba[90]) was expounded in Ḥayyūj's first three books. Through its translation into Hebrew (by Moses Gikatilla in eleventh-century Spain, and by Abraham Ibn Ezra in Rome, in 1140–2) and its acceptance by the leading Spanish grammarians as early as the eleventh century, Ḥayyūj's system became the "authorized" standard of Hebrew grammar and has remained so ever since.[91] Consequently, it is much better known than the achievements of the Oriental grammarians. The novelty of Ḥayyūj's system can be briefly summarized in two main points.

The first point is that the actual forms attested in the language result from changes in the underlying derivational base.[92] The derivational base of all Hebrew words is an abstract

[83] Zislin (1990, p. 17) quotes a work by a younger contemporary of Abū al-Faraj Hārūn's, whom he calls "the second grammarian from Jerusalem."
[84] See Bacher (1895), p. 249.
[85] Zislin (1990). See de Lange (1999), p. 156.
[86] Jastrow (1897). The Hebrew translation by Abraham Ibn Ezra was edited by Dukes (1844b) and Nutt (1870).
[87] Jastrow (1897). The Hebrew translation by Moses Ibn Gikatilla was edited by Nutt (1870).
[88] Jastrow (1897). The Hebrew translation by Moses Ibn Gikatilla was edited by Nutt (1870), and the Hebrew translation by Abraham Ibn Ezra was edited by Dukes (1844b). For a recent Spanish translation of the three grammatical treatises, see Martínez Delgado (2004).
[89] Basal (2001b).
[90] Sáenz-Badillos (2001), p. 47.
[91] Eldar (1990)
[92] See Eldar (1998a), pp. 55–7.

consonantal root (what Ḥayyūj calls *ʾaṣl*), which is not a form that actually occurs in the language. The concept of the abstract root was familiar to Hebrew lexicographers and to some Oriental Hebrew grammarians, such as Ibn Nūḥ, whose concept of the *jawhar* has already been explained. Ḥayyūj's innovation consisted in transferring this "consonantal skeleton" from its purely abstract and philosophical level and applying it as a productive grammatical category: a theoretical base from which words are derived and that can be inferred or reconstructed from the existing words. The grammatical category of the root can be systematically applied to the analysis of all existing words.

The second point is that, as for the composition of this abstract root, Ḥayyūj opted for the triliteral concept: Unlike his predecessors, he postulated that all Hebrew verbs are based on a triconsonantal root, even if one or two consonants drop out or are not immediately visible in some conjugated forms. In many verbs, the derivation of an actual form from its consonantal root involves modifications of various types, such as suppression, assimilation, or gemination of consonants or the "silencing" of a consonant through its transformation into *al-sākin al-layiin*; this originally Arabic grammatical concept (translated by Moses Ibn Gikatilla as *ʾotiyot ha-seter we-ha-mešek̲*[93] and by Abraham Ibn Ezra as *naḥ neʿelam* or "a quiescent letter that can be hidden"[94]) applies to *alef, waw, yod,* and sometimes *he.* If one of these consonants is not vocalized, it sometimes remains in the word, but is not sounded and is thus "concealed."[95] Ḥayyūj's method had the considerable advantage of being applicable in a most systematic way to all verbs, giving a large scope to analogy (*qiyās*) in word derivation. It also made it possible to conceive of the verb conjugation in terms of paradigms (*binyanim*).

As noted, Ḥayyūj's method was a turning point in Hebrew grammatical thought. His ideas were discussed, criticized, and defended in al-Andalus during the eleventh century and later; the controversy nourished many grammatical works.[96] Ḥayyūj's method influenced the work of grammarians such as the vizier of the kingdom of Granada, Samuel ha-Nagid (Ibn Nagdela),[97] and Moses Ibn Gikatilla. It was complemented and adopted (though with points of disagreement) by the most influential of all Spanish grammarians, Abū al-Walīd Marwān (Jonah) Ibn Janāḥ, active in Cordoba and Saragossa in the first half of the eleventh century. Several of Ibn Janāḥ's shorter works were directly related to works by Ḥayyūj:[98]

1. *Kitāb al-mustalḥaq* (Book of Criticism), written in 1012, contains corrections and additions to Ḥayyūj's *Weak Consonants* and *Geminated Verbs,* listing and analyzing fifty verbs omitted by Ḥayyūj.
2. *Risālat al-tanbīh* (Letter of Admonition), written in the form of a letter to a friend, defends the *Kitāb al-mustalḥaq* against an anonymous *Kitāb al-istīfā* (Book of Detailed Occupation) written in Saragossa.
3. *Risālat al-taqrīb wa-al-tashīl* (Letter on Proximity and Making Easier) was intended as an elementary introduction to Ḥayyūj's grammatical approach, but it includes in fact original insights, often influenced by Ibn Janāḥ's knowledge of logic.
4. *Kitāb al-taswiʾa* (Book of Reprobation) is a polemical reply to the critics of his previous works.[99]

93 On Moses Ibn Gikatilla, see Martínez Delgado (2002).
94 Bacher (1882c).
95 See Sivan (1989); Eldar (1984); Eldar (1998a), p. 57; Sáenz-Badillos (2001), pp. 47–8.
96 See, e.g., Sáenz-Badillos and Targarona (1988); Eldar (1989).
97 Poznanski (1909a, 1909b).
98 The shorter works of Ibn Janāḥ were first edited by Derenbourg and Derenbourg (1880). This order of Ibn Janāḥ's five *scripta minora* follows his own list of the previous works in the introduction to his *Lumaʿ*; see Derenbourg (1886), p. 16.
99 For the recent critical edition, see Gallego (2006); also see Gallego (2000).

5. *Kitāb al-tashwīr* (Book of Shaming) consists of rebuttals of the criticisms of Samuel ha-Nagid and his circle, expressed notably in the *Rasāʾil al-rifāq* (Letters of the Companions).[100] Another polemical work by Samuel ha-Nagid, the *Kitāb al-ḥujja* (Book of Evidence), which rejects the arguments of the *Kitāb al-tashwīr*, is known only from quotations.[101]
6. Ḥayyūj's theories, together with the works of Arabic grammarians like the ninth-century al-Mubarrad,[102] form the kernel of Ibn Janāḥ's magnum opus, his *Kitāb al-tanqiḥ*, written circa 1050. This comprehensive work, divided in two parts – a grammar, *Kitāb al-lumaʿ*,[103] and a dictionary, *Kitāb al-ʾuṣūl*[104] – provides the most systematic and comprehensive medieval analysis of biblical Hebrew. This work and its Hebrew translation by Judah Ibn Tibbon (in 1171) became the ultimate model for Hebrew grammarians in medieval Europe.

The ideas of Ibn Janāḥ and Samuel ha-Nagid were apparently the main source for their younger contemporary Abū Ibrahīm (Isaac) Ibn Yashūsh of Toledo (d. 1057), but his work on conjugation, the *Kitāb al-taṣārīf* (*Sefer ha-Ṣerufim* or Book of Inflections), is only known from references by later authors, notably Abraham Ibn Ezra.[105]

The works of Ḥayyūj and Ibn Janāḥ became the model, and their ideas were further developed and supplemented in a series of monographs on more specific grammatical topics. Thus, Moses Ibn Gikatilla, the author of the first Hebrew translation of Hebrew grammatical works written in Arabic (Ḥayyūj's Weak Consonants and Geminated Verbs), was also the author of a monograph on grammatical gender, *Kitāb al-taḍkīr wa-al-tānīth* (Book of Masculine and Feminine), fragments of which have been found among manuscripts in the Firkovich collection.[106] At the end of the eleventh century, Judah ben Samuel Ibn Balʿam (Abū Zakariyyā Yaḥyā; Toledo and Seville) wrote on Hebrew particles (*Kitāb ḥurūf al-maʿanī*) and on denominative verbs (*Kitāb al-ʾafʿāl al-mushtaqqa min al-ʾasmaʾ*). These treatises are structured as alphabetical lists of words with lengthy grammatical discussions.[107] Ibn Balʿam was also the author of a comprehensive grammatical treatise entitled *Kitāb al-irshād* (Book of Guidance), which has not been preserved. Several sources, notably Abraham Ibn Ezra's *Moʾzenei lešon ha-qodeš*, mention a work entitled *Ha-mafteaḥ* (The Key), by Levi ben Jacob Ibn Altabban of Saragossa. This work, which seemed to be important, is known to us only from quotations.[108]

The comparison of Hebrew and Arabic, done on a lexical level in previous generations,[109] was extended to the analysis of grammatical parallels in the *Kitāb al-muwazana bayna al-lugha al-ʿibrāniyya wa-al-lugha al-ʿarabiyya* (Book of Comparison between Hebrew and Arabic) by Ibn Altabban's disciple Isaac Ibn Barūn (Abū Ibrahīm Isaac ben Joseph Ibn Benveniste), written at the end of the eleventh or the start of the twelfth century and preserved only in

[100] Derenbourg and Derenbourg (1880), esp. the passages from the *Rasāʾil al-rifāq*, pp. lix–lxvi. See Perets (1993).
[101] Téné (1971), col. 1382.
[102] For a comprehensive analysis of Ibn Janāḥ's Arabic sources, see Becker (1992a, 1995, 1996, and esp. 1998).
[103] Derenbourg (1886). See Metzger (1889) and also see Munk (1850–1851).
[104] Neubauer (1873–5).
[105] Derenbourg and Derenbourg (1880, p. 20) published some fragments from what they thought was the work of Ibn Yashūsh, but they actually come from a later work, whose further fragments were published by Kokovtzov (1916) and attributed to "Pseudo Ibn Yashūsh."
[106] Allony (1949); Eldar (1998b). Poznanski (1895b) published fragments of Ibn Gikatilla's on the basis of quotations in later grammatical sources, notably in the works of Abraham Ibn Ezra.
[107] Poznanski (1898); Kokovtzov (1916); Abramson (1975).
[108] Pagis (1963–4).
[109] On the linguistic comparisons among Hebrew, Aramaic, and Arabic, see Téné (1983); Maman (1984, 2004).

fragments.[110] In addition to grammatical discussions, this work contains an extensive dictionary, which places it, like Ibn Balʿam's works, at the crossroads of grammar and lexicography. In the linguistic comparisons in this book, Ibn Barūn made extensive use of an abridgment of the Ḥalīl Ibn Aḥmad's *Kitāb al-ʿAyin* by a tenth-century Arab grammarian from Spain, al-Zubaydī.[111]

As we have seen, almost all of the works written in Spain in the post-Ḥayyūj period are in Arabic. The exception is *Ha-ʿAnaq* (The Necklace), by the poet and philosopher Solomon Ibn Gabirol (Malaga, ca. 1021–Valencia, ca. 1058).[112] Written as a long poem in a mixture of biblical and talmudic vocabulary, it follows the style and linguistic features of the classical *piyyut*, even when they are implicitly in disagreement with Ḥayyūj's grammar (e.g., bilateral word formation).[113] This precocious work by Ibn Gabirol (only nineteen years old when he wrote it) is didactic and aims at remedying the low level of Hebrew in Spain: "[T]heir speech is not Hebrew. . . . Half speak Edomite [Spanish] and the other Arabic," he wrote in his introduction.

Lexicography

Glossaries. Glossaries are the simplest form of lexicographical work. The genre develops naturally from the study of classical texts. The founding texts of Judaism are written in Hebrew or Aramaic; by the Middle Ages, these were no longer the Jews' vernaculars. It is therefore not surprising that the glossary genre was well represented during the period under consideration or even earlier. Glossaries on various parts of the Bible, the Mishnah, the Talmud, and even works of medieval authors have been preserved. Their common feature is their structure: They follow the order of the source text and eschew any other form of classification. The lemmata chosen are difficult words, hapax legomena, or terms with unusual meanings in a given context. They are quoted in the grammatical form in which they appear in the text. The origin of glossaries as such is related to the context of teaching. The primitive forms probably consisted of scholia – translations or short comments written in the margins or between the lines of a studied text. Later these marginal annotations were gathered into independent works, copied separately from the text they concern in structured books or fascicles, often laid out in parallel columns.

BIBLICAL GLOSSARIES. Probably the most ancient independent biblical glossary known to us is a Hebrew-Greek glossary from the Cairo Geniza (TS F 17. 4), dated on paleographic grounds to circa 900 or slightly earlier.[114] This manuscript is a palimpsest: The upper text contains passages from the Palestinian Talmud, overwriting a glossary of difficult words in the Bible. The Hebrew entries, written in Hebrew characters, are provided with Greek translations in a parallel column, written in Greek majuscule script. The preserved fragment (probably a second bifolium from a quire) covers the books of Exodus, Isaiah, and Jeremiah. The Hebrew entries follow the order of the text and appear in the grammatical form in which they are attested. The Greek translations reflect the form of the Hebrew entries. They are not taken from the Septuagint or any other known Greek version (although some affinities with Aquila can be identified). This is a unique example of a bilingual and bialphabetical Bible glossary in Greek. There are, however, glossaries in which both Hebrew and Greek are

[110] See Kokovtzov (1893); see also Bacher (1894b); Wechter (1964).
[111] Becker (1999).
[112] Neumark (1936); Sáenz-Badillos (1980a).
[113] See Sáenz-Badillos (1993), p. 223.
[114] Tchernetska, Olszowy-Schlanger, and de Lange (2007).

written in Hebrew characters.[115] Nevertheless, contemporary or slightly later Hebrew-Arabic glossaries are more frequent among Geniza fragments.[116]

Along with these simple glossaries, which contain the Hebrew terms followed by a one-for-one translation, there also exist more sophisticated works that supplement the simple glossaries with more elaborate comments (often of a grammatical nature) and with contextual quotations from the Bible. The earliest grammatical commentaries of this type are the aforementioned Karaite texts in Judeo-Persian from the Cairo Geniza and the *Diqduq* of Ibn Nūḥ, as well as the *Kitāb al-nutaf*, the grammatical commentary on the Prophets by Judah Ḥayyūj.[117] In the eleventh century, Abū al-Faraj Hārūn Ibn al-Faraj wrote a comprehensive glossary on the entire Bible, the *Tafsīr al-ʾalfāẓ al-ṣaʿba fī al-Miqra* (Explanation of Difficult Words of the Bible). This work, preserved in several manuscripts, explains the Hebrew lemmata by their Arabic equivalent and throughout the context of biblical references containing the same word, as well as by occasional short grammatical comments.[118]

MISHNAH AND TALMUD. Glossaries of difficult words in the Mishnah and the Talmud stemmed probably from the Gaonic studies of these texts. The earliest glossaries known to us have been preserved in the Cairo Geniza. Most fragments are bilingual Hebrew/Aramaic and Arabic glossaries written in Hebrew characters, compiled by Geonim, including Saadia Gaon, who wrote the *ʾAlfāẓ al-Mishna.* This glossary, preserved today only in a few fragments, apparently covered all six mishnaic orders.[119] In addition to these Gaonic glossaries, whose target language is Arabic, we also have a single parchment leaf from a glossary on difficult words in Mishnah *Kilʾayim* translated into Greek, written in Greek majuscules. This fragment, from the Antonin collection in St. Petersburg (MS Evr. III. B), is interesting evidence of language-oriented studies of the Mishnah among Greek-speaking Jews around the year 900 or slightly later.[120]

Word Lists. Word lists are groupings of words with a thematic or logical connection and do not follow the alphabet. The earliest example of a "thematic" nonalphabetical word list known to us is the *Kitāb al-sabiʿin lafẓa al-mufrada* (Book of Seventy Hapax Legomena) by Saadia Gaon. Despite the number mentioned in the title, surviving versions of this list contain ninety-one biblical hapax legomena. Their meaning is explained not only through an Arabic translation but also through their etymological connections with words found in the Mishnah.[121] Some lists of the vocabulary of daily life in vernacular languages such as Armenian and Provençal, in Hebrew characters, were found in the Cairo Geniza.[122]

Alphabetic Dictionaries. Today the arrangement of dictionaries, in which a word is located by the alphabetic order of all of its letters, is the norm. Such an arrangement was, however, far from evident during the Middle Ages. Although the Hebrew (and Arabic) tradition used the alphabetical arrangement in lexicography much earlier and more consistently than the Latin

[115] See de Lange (1996), No 10.

[116] See Eldar (1992a), p. 359; Polliack and Somekh (2000).

[117] Basal (2001b). See previously Harkavy (1895, 1901); Kokovtzov (1916), pp. 1–50; Allony (1963); Abramson (1978, 1979); Eldar (1979); Basal (1995).

[118] See Olszowy-Schlanger (2001). See previously Harkavy (1881), p. 158; Poznanski (1896), p. 214.

[119] Allony (1979). The identification of the fragments published by Allony as from Saadia's glossary was rejected by Abramson (1980).

[120] See Papadopoulos-Kerameus (1908), who proposed an earlier date in the eighth century. See also Starr (1934–5).

[121] Ewald and Dukes (1844b). For the Geniza fragments of the work, see Klar (1954); Allony (1958); Dotan (1989); and Eldar (1992a), p. 362; also see Eldar (1994–5).

[122] See Shivtiel (2005, 2007).

West did, the principles for ordering of words in dictionaries were also the object of trials and experiments. The difficulties were further enhanced by the lack of uniformity in defining the basic forms under which the entries would appear in a dictionary. This stipulation of basic forms of lexicographical items is parallel to the quest to define the derivational base in grammar; in most cases the choice of a form as the basic lexical entry corresponds to the underlying grammatical approach represented by the compilers of dictionaries.

SEFER ʾEGRON —DICTIONARY OF WORDS. The first known Hebrew dictionary organized according to the order of the Hebrew alphabet is the *ʾEgron* of Saadia Gaon;[123] its first edition, in Hebrew, was compiled in Egypt in 902, and the second, in Arabic, was written some twenty years later in Iraq.[124] As attested by the title of the Arabic version, *Kitāb ʾuṣūl al-shiʿr al-ʿibrānī* (Book of Roots of Hebrew Poetry), the *ʾEgron* was primarily conceived as a tool for poets. In the extant sections of the work, the lemmata are arranged by the first two consonants. In conformity with Saadia's grammatical approach already described, all lemmata are nominal: nouns, adjectives, participles, and verbal nouns. They include both biblical and postbiblical words, as well as some neologisms attested in piyyutim. The second part of the *ʾEgron*, which has not been preserved but which is mentioned in the introduction to the second edition, was apparently arranged according to the alphabetical order of the last letter. Such an arrangement must have been a tool for poets in search of rhymes. Two anonymous early dictionaries of the Bible, whose fragments were found in the Geniza, display some similarity to the *Sefer ʾEgron* in their arrangement and their choice of lemmata.[125]

ALPHABETIC DICTIONARIES OF THE BIBLE. In the Orient, the first systematic and complete dictionary of biblical Hebrew is the *Kitāb jāmiʿ al-ʾalfāẓ* (Book of Collection of Words) by the Karaite author David ben Abraham al-Fāsī, who was active in Jerusalem in the tenth century.[126] The entries in the *Kitāb jāmiʿ al-ʾalfāẓ* are arranged alphabetically by the consonants of the abstract roots. The dictionary contains twenty-two sections, corresponding to the consonants of the Hebrew alphabet; each section contains all the roots whose initial consonant corresponds to the consonant of the section. These sections are subdivided into subsections, again alphabetically, by the second consonant of each root. Thus the dictionary is organized into small sections, each with a two-consonant heading. Under each heading, relevant words and biblical references are listed and translated into Arabic. Many entries also contain more elaborate grammatical, masoretic, halakhic, and exegetical digressions. Comparisons among Hebrew, Arabic, and Aramaic are frequent. It is noteworthy that, in line with the tradition of Karaite Bible translations of the time, al-Fāsī strives whenever possible to translate Hebrew (or Aramaic) words by their Arabic cognates, even if these etymologically or phonetically related equivalents are uncommon Arabic words and their use seems artificial.[127] As we saw before, the concept of abstract roots was known to early Karaite grammarians, though not as a grammatical derivational base. In al-Fāsī's system, roots consist only of those consonants that remain in the inflection, so there are roots composed of one, two, three, or four consonants.[128]

Kitāb jāmiʿ al-ʾalfāẓ was influential; several abridgments were made shortly after it was compiled: the first, probably by the author himself;[129] the second, today lost, in the tenth century by the Jerusalem exegete Abū Saʿid Yefet ben ʿAli; and the third, in the eleventh

[123] Allony (1969).
[124] Ibid., pp. 23–25; Goldenberg (1973), p. 117.
[125] Dotan (1988).
[126] Skoss (1936–45).
[127] See Maman (1992).
[128] See Skoss (1936–45), pp. 4–10.
[129] See ibid., pp. xciv–cxx.

century, by ʿAli ben Suleimān.[130] The most unexpected evidence of the popularity of al-Fāsī's dictionary is the presence of what seems to be a Hebrew reworking of the introductory sections of the *Kitāb jāmiʿ al-ʾalfāẓ* (attributed in the manuscript to a certain Abraham ha-Bavli) in a thirteenth-century manuscript written in France or in England.[131]

The early lexicographers in North Africa and Spain adhered to a similar concept of the Hebrew root. Contemporary with the work of al-Fāsī is the *Risāla* (Letter) by the North African scholar Judah Ibn Quraysh. This alphabetical lexicon contains three separate sections, in which biblical Hebrew is compared respectively with Aramaic, with mishnaic Hebrew, and with Arabic. These sections are preceded by an introduction, which contains an early presentation of and apology for such linguistic comparisons.[132] The concept of the root underlying the arrangement of the *Risāla* is similar to al-Fāsī's: one-, two-, three-, or four-consonantal roots are posited. Ibn Quraysh was apparently also the author of another lexicographical work, a treatise on biblical words beginning with *alef*. This work has not been preserved, but several quotations have been identified in later works.[133]

A similar theory of roots composed of either one, two, three, or four consonants underlies the earliest Spanish dictionary, Menaḥem ben Saruq's *Maḥberet*, composed in Cordoba, sometime in the third quarter of the tenth century.[134] Unlike his Oriental and North African predecessors who wrote their Hebrew dictionaries in Arabic, Menaḥem opted for a dictionary in which "a language is explained from itself": All biblical Hebrew words are explained in Hebrew, preferably biblical, often through synonyms or references to the same words used in different biblical contexts. The *Maḥberet* played an important role in the development of Hebrew grammatical thought. The fruit of many years of work, issued progressively in separate parts or quires corresponding to roots beginning with consecutive Hebrew letters, the *Maḥberet*, along with its author, came under virulent criticism from a younger grammarian, originally from North Africa but trained in Baghdad as a disciple of Saadia Gaon, Dunash ben Labrāṭ.[135] This scholar was also known for his *Tiqqun ha-šegagot* (Correction of Errors), a list of 192 criticisms of selected issues in Saadia's *ʾEgron*, *Kitāb faṣīḥ*, and Arabic translation of the Pentateuch.[136] The publication of Dunash's *Tešuvot* met immediately with opposition from Menaḥem's disciples, Iṣḥaq Ibn Capron, Judah Ibn Da'ūd (perhaps identical with Ḥayyūj), and Iṣḥaq Ibn Gikatilla, who wrote a rejoinder entitled *Tešuvot talmidei Menaḥem*.[137] This rejoinder was in turn virulently attacked by one of Dunash's disciples, Yehudi ben Sheshet, whose *Tešuvot* are extant.[138] These polemics, which were heated and often full of personal attacks, ended badly for Menaḥem, who lost support of his patron, Ḥasdai Ibn Shaprut.[139] Nevertheless, the controversy generated a number of important works that, written entirely in Hebrew, were influential not only in Spain, but also in non-Arabophone countries, notably in

130 See Skoss (1927–8), p. 31.

131 MS Oxford, Bodl. Or. 135 (cat. 1466), ed. Neubauer (1863b). See Maman (1984), p. 243.

132 See Becker (1984). D. Becker mentions an anonymous unpublished dictionary of the Hebrew Bible and the Mishnah (MS Oxford, Bodl. Or. 79, cat. 1504), which mentions Ibn Qurayish and has some common features with the *Risāla*; see Becker (1984), p. 84, and Becker (1992b), pp. 15–17.

133 Becker (1984), pp. 13–17, 82–7; also see Becker (1992b).

134 Sáenz-Badillos (1986; previous edition Filipowski, 1854). On the similarities between the earlier Oriental school, and notably between the work of David ben Abraham al-Fāsī and the *Maḥberet*, see Pinsker (1860), pp. 170–5 (he considers Menaḥem ben Saruq to be a Karaite grammarian); Skoss (1936–45), p. xxix.

135 Sáenz-Badillos (1980; previous edition Filipowski, 1855). See also Allony (1965).

136 Schröter (1866); see Del Valle Rodríguez (1981), p. 133.

137 Benavente Robles (1986; previous edition Stern, 1870).

138 Varela Moreno (1981; previous edition Stern, 1870).

139 For an overview of the controversy, see Del Valle Rodríguez (1981), pp. 111–38 et passim; Del Valle Rodríguez (2002), pp. 251–71.

northern Europe and Italy. Thus the *Maḥberet* and the *Tešuvot* were the main lexicographical source for exegetical works, chief among them Rashi's commentaries.

The most comprehensive and influential dictionaries of the Hebrew Bible, though, are those produced after the concept of the triliteral root was firmly established by Ḥayyūj. The comprehensive dictionary *Kitāb al-istighnā* (Book of Amplitude), by Samuel ha-Nagid (1040s), is not preserved in its entirety.[140] It is the aforementioned *Kitāb al-ʾuṣūl*, that is, the lexicographical part of Jonah Ibn Janāḥ's *Kitāb al-tanqīḥ*, in which the triliteral theory of the root found its full application. *Kitāb al-ʾuṣūl* and its Hebrew translation by Judah Ibn Tibbon (*Sefer ha-Šorašim*) were the main models for the subsequent Hebrew dictionaries. An important work is Judah Ibn Balʿam's *Kitāb al-tajnīs* (Book of Homonyms), which lists biblical words with two different meanings.[141]

ALPHABETIC DICTIONARIES OF THE MISHNAH AND TALMUD. At least three lexicographical works on the talmudic literature were compiled before the middle of the eleventh century, but two of them are lost today. The earliest was probably the *ʿAruḵ*, by Ṣemaḥ ben Paltoi, the Gaon of Pumbedita (second half of the ninth century).[142] It has not been preserved and is known only through a few quotations in the works of Nathan ben Jeḥiel of Rome and the fifteenth-century author Abraham Zacuto. These quotations are not extensive enough to allow us to determine whether this work was arranged alphabetically, by the order of the text, or in some other way. Another talmudic dictionary was compiled in the early eleventh century in Mainz by Machir ben Judah, the brother of the famous Rabbenu Gershom. This work, known today from quotations in the commentaries of Rashi and the tosafists, was quite probably alphabetically arranged, because it was known as the *Alfa Beta de-Rabbi Maḵir.*[143] The earliest extant dictionary, preserved notably in the Cairo Geniza, is the alphabetic list of technical Aramaic terms in the Babylonian Talmud, included as chapter 143 of the *al-Madkhal ʾilā ʿilm al-Mishna wal-Talmud* (Introduction to the Study of the Mishnah and Talmud) by Samuel ben Ḥofni, the Gaon of Sura (ca. 997–1013).[144] It was only at the very end of the eleventh century that the first comprehensive talmudic dictionary was written in Italy by Nathan ben Jeḥiel of Rome (see the following text).

THEMATIC DICTIONARIES. Dictionaries of professional terms, philosophical concepts, lapidaries with lists of precious stones and their virtues accompanied by a vernacular translation,[145] and so on, sometimes arranged alphabetically, are a genre that can be classified as belonging both to linguistics and to a particular professional or scientific field. Such dictionaries were compiled already during the eleventh century. The medical dictionary by Jonah Ibn Janāḥ, for example (lost and known today only from later quotations), contained names of medicines, remedies, and plants, probably listed in alphabetical order.[146] Several thematic and professional dictionaries from later periods are known, such as Maimonides' *Sharḥ ʾasma ʾal-ʿuqqār* (Explanation of the Names of Medicines), compiled around 1200.[147]

Anagrammatic Dictionaries. As already mentioned, in the early period, an alphabetic arrangement was not the only way to structure comprehensive dictionaries. Some dictionaries followed an anagrammatic principle: The words explained in the dictionary were classified into

140 See Poznanski (1909a); Kokovtzov (1908); Maman (2003), p. 304. For some fragments that were attributed to this dictionary, see Kokovtzov (1916), pp. 205–25. For quotations in a later work, see Perets (2000).
141 Abramson (1963).
142 Eldar (1992a), p. 363. Abramson (1984, p. 28) doubts the existence of Ṣemaḥ ben Paltoi's dictionary.
143 See Grossman (2001), pp. 102–5.
144 Assis (1991).
145 See Steinschneider (1897).
146 Amar and Serri (2000–1).
147 Meyerhof (1940). I thank Prof. Gad Freudenthal, to whom I owe this reference.

groups of roots that could be obtained by all possible permutations of their consonants. Two such dictionaries are known to us, both fruits of the Oriental grammatical tradition, and both dating from the early eleventh century: the *Kitāb al-Ḥāwī* (Collecting Book, partially preserved among the Cairo Geniza manuscripts) by Hai ben Sherira Gaon,[148] and the seventh section of the aforementioned *Kitāb al-Mushtamil* by Abū al-Faraj Hārūn.[149] Although the latter concerns only biblical Hebrew, the *Kitāb al-Ḥāwī* contains postbiblical words as well. This work includes roots that Hai Gaon considers to have two consonants (e.g., בא אב). Abū al-Faraj's dictionary includes only sound triliteral consonantal roots, arranged alphabetically, and includes under the heading of one root all attested roots that result from the permutation of the consonants of the entry root. For example, under ערף we also find פער, רעף, עפר, and פרע.

Phonology and Phonetics: "Guides for the Correct Reading of the Bible"

A characteristic genre of Hebrew medieval linguistic literature is that of the "guides for the correct reading of the Bible," which deal with the classification, function, and pronunciation of consonants and vowels, as well as detailed rules of the biblical cantillation marks (*ṭeʿamim*). This genre corresponds to what would be defined today as phonology and phonetics and seems to have close affinities with the field of biblical textual criticism – the Masorah.

First written as marginalia in Bible codices, masoretic notes were soon gathered in independent treatises as early as the ninth and the tenth centuries. The primary aim of the Masorah is to record rules and anomalies of vocalization, cantillation signs, and orthography, in order to ensure the correct transmission of the text of the Bible. Although not primarily linguistic, even succinct masoretic notes contain a certain amount of grammatical and lexicographical information. It has even been argued recently that the role of the masoretic notes, and notably of various word lists included in the Masorah Magna and in the so-called cumulative Masorah, was more important for the creation of Hebrew lexicography than direct Arabic influence.[150] The close relationship between the Masorah and grammar is further attested by the fact that linguistic works were occasionally used and partly incorporated into masoretic notes in Bible codices: Passages of Menaḥem ben Saruq's *Maḥberet* were incorporated into the Masorah Magna of an eleventh-century codex of the Pentateuch.[151]

More specifically grammatical material can be found in independent masoretic treatises, which often include theoretical grammatical concepts and terminology. Some of these treatises were compiled in Hebrew: *Diqduqei ha-miqraʾ* (a list of masoretic terms),[152] *ʾOḵlah we-ʾoḵlah* (pairs of biblical words that differ in minute details),[153] and *Diqduqei ha-ṭeʿamim* by Aaron ben Moses ben Asher.[154] Slightly later, in the tenth century, works were written in Arabic: treatises on the Hebrew vowels, including *Kitāb al-muṣawwitāt* (Book of Vowels)[155]

148 Maman (1999, 2000). See Steinschneider (1901).

149 See Bacher (1895), p. 252; Maman (2002).

150 Dotan (2005).

151 See Ofer (1999). The genetic relationship between masoretic works and grammar is also suggested by the similarity in terminology and preoccupations of the earliest Karaite grammarians, in the tenth century (and maybe even before), who were adepts of a discipline of *diqduq* and masoretic treatises; see Khan (2001a), pp. 128–9. It has been suggested that Hebrew grammatical methodology and terminology started to develop concomitantly with vocalization systems and in close relationship with the Masorah and exegesis; see Dotan (1990); Khan (2000a), pp. 23–5.

152 Ginsburg (1905), Vol. 4, p. 36, col. 2; Mann (1926); Allony (1964a).

153 Diáz Esteban (1975).

154 Baer and Strack (1879); Dotan (1967). Also see Eldar (1987).

155 Allony (1964–5).

and *Seder ha-simanim* (Order of Signs),[156] on the consonants,[157] and on the schwa.[158] The grammatical concepts used in these works, such as the division of Hebrew letters into radical and servile letters, first made in *Diqduqei ha-ṭeʿamim*, were adopted by Saadia Gaon and later grammarians.

These early works written in Arabic seem to be related to the later "guides for the correct reading of the Bible." As noted, the first work that can be defined as belonging to this genre is Saadia's *Kitāb faṣīḥ*.[159] The most influential work of this genre was undoubtedly the *Hidāyat al-qāriʾ* (Guide for the Reader). Copied, translated into Hebrew, and studied without interruption throughout the Middle Ages, and considered by modern scholars to be the highest achievement of Tiberian masoretic grammar,[160] the *Hidāyat al-qāriʾ* has only recently been identified as yet another work by the prolific Karaite grammarian Abū al-Faraj Hārūn.[161] The *Hidāyat al-qāriʾ* consists of three main parts, dealing respectively with consonants (classification of consonants according to their place of articulation, the double pronunciation of *beged kefet* and *resh*, addition, elision, assimilation or permutation of consonants in a word, classification of Hebrew roots according to the number of consonants, etc.), vowels (seven vowels and the *matres lectionis*, classification of the vowels by their place of articulation, the rules of the schwa, structure of syllables, etc.), and the cantillation marks (the *ṭeʿamim* of the twenty-one prose books, the *ṭeʿamim* of the three poetic books, and the syntactic and phonological role of the *ṭeʿamim*). The *Hidāyat al-qāriʾ* and its abridgment (*Mukhtaṣar*) were extensively copied during the Middle Ages; an impressive number of Oriental manuscripts of both versions survive.[162]

Summary

The linguistic description of the Hebrew language initiated in the tenth and eleventh centuries was closely related to the particular importance attributed to the grammatical study of Hebrew for the correct interpretation and transmission of the Bible. The tools of linguistic description created in this period include grammatical compendia, glossaries, and dictionaries, as well as monographs on the rules of the Tiberian tradition of reading the Bible or dealing with specific grammatical topics, such as a comparison between cognate languages or verb morphology. Already at its initial stage, Hebrew linguistics appears as a well-developed, full-fledged discipline, no doubt thanks to its roots in the more ancient masoretic tradition and to its openness to Arabic grammatical methods. The efforts of "grammatization" were fruitful: The Hebrew language emerges from this formative period endowed with sets of comprehensive grammatical rules and concepts. The achievements of Hebrew grammar and lexicography during this early period became the main source for later developments.

156 Allony (1964b).
157 Allony (1973–4).
158 Levy (1936); Allony (1943–4).
159 Dotan (1997).
160 Edited by I. Mercerus in Paris, in 1556 and 1565, as a work by Ibn Balʿam. This wrong attribution to the Spanish grammarian is found in a colophon of MS Paris, BNF héb. 1221, copied in 1285–7, which contains a Hebrew translation (made in Italy) of the *Hidāyat al-qāriʾ*, the *Sefer ṭaʿamei ha-Miqraʾ*. The attribution to Ibn Balʿam was questioned by Wickes (1881), pp. 104–5; Busi (1984), p. 19; Eldar (1985); and Eldar (1994), pp. 17, 40–2.
161 See Busi (1984), p. 21; Eldar (1992b), p. 72; and Eldar (1994), pp. 40–2. Eldar discovered a colophon that names Abū al-Faraj Hārūn as the author of the work (MS Manchester, John Rylands Library, A694).
162 Eldar (1994), pp. 43–7; in this publication Eldar described the longer version. The shorter version was edited by Eldar in an earlier publication (1986–7). A critical edition is being prepared by G. Khan. See also Busi (1983).

THE CONSOLIDATION AND DIFFUSION OF HEBREW LINGUISTICS

There is no doubt that the tenth and eleventh centuries were crucial periods in the formation of the discipline of Hebrew linguistics. It is not surprising that modern historians have tended to consider these early years (especially around the introduction of Ḥayyūj's system) as the "creative period" par excellence. By contrast, the twelfth to sixteenth centuries are sometimes considered as a period of mere dissemination of the earlier achievements or, indeed, a time of the "cessation of original contribution in Hebrew linguistics."[163] However, this rather negative view is slightly exaggerated and does not attribute sufficient importance to the changing aims of the discipline.

The aims of the linguistic works, including those of the early period, as often stated in their introductions, include knowledge of grammar for the correct interpretation of the Bible, preoccupation with the oblivion into which Hebrew has fallen despite its "sacred" character, its pre-Babel antiquity, and its role as the language of the Jewish people, as well as the inaccuracy of Hebrew as written by contemporary Jews. However, despite their stated purpose to guide and correct Hebrew usage, the early grammars of the "formative" period were not language manuals or pedagogical tools to facilitate the study of the Hebrew language. Rather, they were highly theoretical scientific works designed for the scholarly public already well versed in the Hebrew language as such. This is not the case with the large majority of the later Hebrew grammars, whose lucid style and coherent structure best served the purpose of education.

In the twelfth and thirteenth centuries, the works of earlier grammarians, written in Arabic, were still read, and new treatises were composed. Nevertheless, from the end of the eleventh century onward, Hebrew linguistics was expressed mainly in Hebrew and increasingly studied outside Arabophone countries. By the late eleventh century, European and Byzantine Jewish scholars had access to Oriental and Spanish grammar books and dictionaries, initially those written in Hebrew: Menaḥem's *Maḥberet* and Dunash's *Tešuvot*. Together with the *ʿAruḵ* of Nathan ben Jeḥiel of Rome, these books became the basis of early linguistic thinking and exegesis in Europe.

However, the major Arabic works of the Oriental and Spanish schools also became available in a series of Hebrew versions made soon after their composition. Such translations were made of the works of five authors. David ben Abraham al-Fāsī and Abū al-Faraj Hārūn, representatives of the Oriental school of Hebrew grammar, were translated in Italy and Ashkenaz. The identity of the translators and the sources of their knowledge of Arabic are unknown. As for the Spanish grammarians, three works by Ḥayyūj and three by Ibn Janāḥ were translated in Spain, Italy, and Provence by Spanish translators; Saadia Ibn Danān (fifteenth century) translated his own works. I have already mentioned the translation of Ḥayyūj's works, by Moses ha-Kohen Gikatilla, in the third quarter of the eleventh century, and by Abraham Ibn Ezra, in the 1140s in Rome. Translations were also made of the works of Ibn Janāḥ. The most important was Judah Ibn Tibbon's translation of *Kitāb al-tanqīḥ* (Lunel, 1171). Under the overall title *Sefer ha-Diqduq* (the first part, *Kitāb al-lumaʿ*, was translated as *Sefer ha-Riqmah*,[164] the second part, *Kitāb al-ʾuṣūl*, as *Sefer ha-Šorašim*[165]). Ibn Janāḥ's other works were translated during the twelfth and thirteenth centuries: *Kitāb al-tanbīh* (The Book of Admonition) was translated by Judah Ibn Tibbon as *Sefer ha-Heʿarah*. *Kitāb al-taswiʾa* (Book of Reprobation) was translated by Solomon ben Joseph ben Job (Ayyūb), under the incorrect

[163] Téné (1971), col. 1358.
[164] Goldberg and Kirchheim (1856); Wilensky (1929; reedited with additions by Téné 1964).
[165] Bacher (1896c). There were other translations of Ibn Janāḥ's dictionary, such as a fragment of an anonymous translation from the "Italian Geniza"; see Perani (1993).

title *Sefer ha-Hašwaʾah* (Book of Comparison), of which only fragments are preserved.[166] *Kitāb al-mustalḥaq* was translated as *Sefer ha-Haśśagah* (Book of Criticism) by Obadiah ben Samuel ha-Sefaradi, who was active in northern France at the end of the twelfth century.[167] *Risālat al-taqrīb wa-al-tashīl* was translated by Jacob ben Isaac Romano as *ʾIggeret ha-qeruv we-ha-ʾiššur.*[168] As we shall see, the works of the Karaite school of Jerusalem, too, were translated in the twelfth century, in Byzantium, Ashkenaz, and Italy (see Table 19.3).

Alongside this translation activity, original grammatical works modeled on those of the eleventh-century predecessors were composed – but now in Hebrew. New Hebrew terminology was coined, and the rules of grammatical description were further discussed and defined. Indeed, it can be argued that only at that time did Hebrew grammatical literature become fully detached from the Arabic linguistic tradition and emerge as an independent branch of Hebrew science. Together with the shift from Arabic to Hebrew, there was also a shift in the purpose of grammatical literature itself. Linguistic theory was still very present, but more systematic and comprehensive works, such as those of Abraham Ibn Ezra and especially of David Qimḥi, acquired a growing pedagogical dimension. Even more so, works such as *Mahalak̲ševilei ha-daʿat* (Walking the Paths of Knowledge), by Moses Qimḥi (David Qimḥi's older brother and teacher), were popular grammatical primers destined for elementary teaching. From the thirteenth century onward, we find simplified abridgments or basic grammar books, often by anonymous authors, compiled for the needs of teaching and learning Hebrew.

Literary creativity in Hebrew linguistics is no longer restricted to the countries of its origin (Babylonia and Palestine in the Orient; Spain in the West) but becomes widespread in all Jewish communities. As stated before, the influence of the Oriental school is very slight: Only a few works from Byzantium and Ashkenaz represent and continue the Oriental approach to grammar. Rather, it is the classical Spanish tradition as developed by Ḥayyūj and Ibn Janāḥ that is the main source for later works written both in the Orient and Byzantium and in Western Europe and Italy.

The following paragraphs offer a brief inventory of the grammatical and lexicographical works in chronological order and by geographical origin. Geographical classification is sometimes difficult, because authors traveled frequently and the same individual often wrote books in different places: For example, the Spanish-born Abraham Ibn Ezra wrote his grammatical works in Italy and in both southern and northern France before he traveled to England. Despite this difficulty, works are classified here by their place of composition, on the assumption that they answered certain needs and reflected intellectual influences in that particular place (even if this means that authors like Abraham Ibn Ezra appear under several different headings).

The Orient

Although Hebrew linguistics in the West was now written in Hebrew, Oriental authors continued to write in Arabic. The Arabic works of the tenth- and eleventh-century grammarians were still studied and copied in subsequent centuries in Arabic-speaking Jewish communities. New works in Arabic were composed, especially in Palestine, Egypt, and Yemen. A series of books were devoted to a description of the language of the Samaritans: Abū Iṣḥaq Ibrāhīm ben Faraj ben Marūt's *Kitāb al-tawṣiʾa* (*Sefer ha-Maslul* or Book of the Path; twelfth century) and its abridgment by Eleazar ben Phineas ben Joseph (fourteenth century), or *Ha-meliṣ*,

[166] See Camacho Padilla (1929).
[167] See Téné (1971), col. 1386. For the critical edition based on two extant manuscripts, see Téné (2006).
[168] See Gallego (2006), p. 11.

a Hebrew-Aramaic-Arabic dictionary of the Samaritan Pentateuch (thirteenth century).[169] Some works of this period were still faithful to the Oriental grammatical approach. Such is the case with the Yemenite grammatical treatises copied to serve as a preface to the *tijān* (plural of *taj*, "vocalized Pentateuch codex"). These grammatical prefaces, preserved in Arabic and Hebrew recensions, have been shown to be versions of the *Hidāyat al-qāriʾ* of Abū al-Faraj Hārūn.[170] Indeed, the works of the early grammarians of the Oriental school were not altogether forgotten. For example, most of the nearly one hundred surviving manuscripts of Abū al-Faraj Hārūn's *Kitāb al-kāfī* were copied in the twelfth to fourteenth centuries or even later.[171] However, the large majority of the manuscripts copied in the Orient were the works of the Spanish authors; most of the newly composed original works also followed the more popular Spanish school. This is notably the case of a Karaite biblical dictionary, the *Kitāb al-Taysīr* (Book of Facility), by Solomon ben Mubārak (end of the thirteenth to the beginning of the fourteenth century), recently identified by José Martínez Delgado.[172] This comprehensive Hebrew-Arabic dictionary of the language of the Bible quotes several authors from Spain and southern France, notably Judah ibn Janāḥ, Jacob ben Eleazar, and David Qimḥi.

A grammar written probably in Yemen by a certain Nathanael, identified with Nathanael Fayyumi, dates from the twelfth century.[173] Although only partly preserved, this interesting work seems to follow Arabic models. Written in Arabic, it deals with the theoretical Aristotelian approach to aspects of Arabic grammar and then of Hebrew grammar in separate chapters.

In the thirteenth century, Isaac ben Eliezer ha-Levi of Baghdad wrote two grammatical works, *Śefat yeter*, a Hebrew abridgment of the works of Ḥayyūj and the *Kitāb al-mustalḥaq* of Ibn Janāḥ,[174] and *ha-Riqmah*, composed for the author's student Aaron ben Abraham. This still unpublished work on homonyms, synonyms, geminative verbs, and other grammatical issues includes a number of comparisons with Eastern Christian Aramaic (or Syriac) dialects.[175]

From the thirteenth century, we have the important work of the Bible exegete Tanḥum Yerushalmi (d. Fostat, 1291). In addition to Bible commentaries, this author wrote a Hebrew-Arabic dictionary of rabbinic Hebrew, *al-Murshid al-kāfī* (The Comprehensive Guide), of which several manuscripts, including the autograph, have survived.[176] Its main aim was to render Maimonides' *Mishneh Torah*, written in Hebrew, accessible to Arabic-speaking Jews. The scope of this dictionary is much broader, although it deals with rabbinic Hebrew in general, applying the grammatical approach of the Spanish school to it. Structured according to triliteral Hebrew roots, *al-Murshid al-kāfī* refers to the Spanish grammarians of biblical Hebrew, such as Ḥayyuj, Ibn Janāḥ, and Abraham Ibn Ezra, as well as the talmudic dictionary by Nathan ben Jeḥiel of Rome.[177]

Byzantium–Turkey

The history of Hebrew linguistic thought in Byzantium has received very little scholarly attention. This tradition rested on various sources of influence, some of which are of considerable

[169] All these works were edited by Ben-Hayyim (1957).
[170] The Arabic abridgment was edited by Neubauer (1891) and the Hebrew one by Derenbourg (1870). See Bacher (1891b); Busi (1984), pp. 31–2; and esp. Eldar (1992c).
[171] See Khan, Gallego, and Olszowy-Schlanger (2003), pp. liii–lxix.
[172] See Martínez Delgado, 2010.
[173] Kokovtzov (1916), pp. 173–89; see Hirschfeld (1926), p. 69.
[174] Still unpublished; the introduction was printed by Poznanski (1895c), pp. 251–62. See Téné (1971), col. 1387.
[175] MS Paris, BNF, héb. 1225 of *Sefer ha-Riqmah* is probably contemporary with the author. It contains ownership inscriptions dated 1602 and 1608 (probably of the "Seleucid Era," corresponding to 1291 and 1298 C.E.; the author's name is mentioned with the blessing for the living; see Zotenberg 1866, No. 1225).
[176] Toledano (1951; *aleph–kaf*); Shy (1969; *tav*); Shy (1975). The full critical edition is Shy (2005).
[177] See Ibid., p. כ"ד.

interest, even if no specific "Byzantine" type of Hebrew grammar can be identified. The earliest grammatical works from Byzantium, dated to the end of the eleventh century, were written by Karaite authors and followed the Oriental approach. Although these Oriental ideas, and especially the works of Abū al-Faraj Hārūn, were not altogether forgotten in later periods, from the mid-twelfth century onward, Karaite grammarians in Byzantium followed the Spanish school, with the ideas of Ḥayyūj and Ibn Janāḥ as their main grammatical models. At the end of the fifteenth century, with the expulsion of the Jews from Spain and Portugal, Western Jewish scholars settled in Turkey and the Greek islands, and Constantinople became a major center for the printing of Hebrew works on linguistics.

The earliest linguistic works produced in Byzantium were Hebrew translation-adaptations of the Arabic texts by Karaite authors of the Oriental school, notably Abū al-Faraj Hārūn Ibn al-Faraj. An important example is the still largely unpublished encyclopedic compilation *ʿAdat devorim* (Swarm of Bees) by the Karaite author Joseph of Constantinople (ha-Qustandini), probably from the end of the eleventh century. This work is extant in a unique manuscript in St. Petersburg (II Firkovich Evr. 161), copied by a certain Judah ben Jacob ben Judah in a town called Gagra (probably on the eastern shore of the Black Sea[178]) in 1207.[179] Among other matters, *ʿAdat Devorim* includes several grammatical-masoretic texts, either originally written in Hebrew or translated from Arabic into Hebrew of a specific Byzantine type. These texts include a copy of *Diqduqei ha-ṭeʿamim* by Aaron ben Moses ben Asher;[180] a Hebrew translation of the Arabic book on the difference between the two masoretic schools of Ben Asher and Ben Naphtali, the *Kitāb al-ḫilāf* by the eleventh-century Egyptian scholar Mishael ben Uzziel; and a Hebrew translation of the abridgment of Abū al-Faraj Hārūn's *Hidāyat al-qāriʾ*.

A year later the same scribe, Judah ben Jacob ben Judah, copied a grammatical anthology, preserved in MS II Firkovich Evr. 132. Together with fragments of Menaḥem's *Maḥberet* and Dunash's *Tešuvot*, and a few folios of an unidentified Hebrew-Arabic lexicon (by a different scribe, and probably joined to the volume at a later date), the volume contains an important Karaite grammar in Hebrew, entitled *Meʾor ʿayin* (Light for the Eye).[181] The beginning is missing, and the author's name is unknown. There is also some uncertainty regarding the exact time and place of its composition. Zislin holds that *Meʾor ʿayin* is based on the ideas of Abū al-Faraj Hārūn, and more precisely on a grammar by one of his followers, whom Zislin calls "the second grammarian of Jerusalem" and places in the mid-eleventh century.[182] As for the *terminus ad quem*, it has been noted that another Byzantine Karaite, Judah Hadassi, in his *ʾEškol ha-kofer* (Cluster of Henna, 1148; see the following text), quoted from a certain work called *Meʾor ʿeinayim.*[183] The similarity of the title as well as the content of the quotation – a list of thirty-five noun patterns that match the corresponding list in *Meʾor ʿayin* – may suggest that it is the same work. However, this identification was proposed and then rejected by Zislin, who pointed out that, according to Hadassi, the author of the *Meʾor ʿeinayim* was a scholar from Tiberias, whereas *Meʾor ʿayin* is obviously a Byzantine Hebrew work. Zislin explained the great similarity in the list of noun patterns between the quotation in Hadassi and *Meʾor ʿayin* by the possibility that both used the same source.[184] Still, the similarity of title and content is striking, and yet another possibility comes to mind: *Meʾor ʿayin* as we have it may not be an original work by a Byzantine Karaite, but, like *ʿAdat devorim,* a Hebrew

[178] Dotan (1967), p. 50; Zislin (1990), p. 11 n. 21.

[179] See Dotan (1967), pp. 51–2; Busi (1984), p. 33 (bibliography n. 27); Eldar (1994), p. 19; de Lange (2001), p. 31. For a later date, ca. 1110, see Allony (1973–4), p. 193.

[180] See Dotan (1967), p. 50.

[181] Zislin (1990). See Maman (1993–4).

[182] Zislin (1990), p. 17.

[183] *ʾEškol ha-kofer,* f. 69a.

[184] Zislin (1990), p. 21.

translation or reworking of an Arabic original by a Palestinian author, known to Hadassi as "the Tiberian." Such a possibility is supported by the fact that the grammatical theory in *Meʾor ʿayin* is essentially that of the Karaite school of Jerusalem. In its present, incomplete, form, *Meʾor ʿayin* contains four chapters: the first on the three parts of speech, the second on verbal paradigms, the third on some aspects of syntax, and the fourth on noun paradigms. The most striking aspect of the work is its dependence on the system of verb "conjugation" formulas – *ʿalāmāt* (*simanim*) – which was notably followed by Abū al-Faraj Hārūn (see earlier text). However, whereas Abū al-Faraj proposed only ten *ʿalāmāt*, the author of *Meʾor ʿayin* lists no fewer than seventeen *simanim*, which correspond almost exactly to the list given by Abū al-Faraj's younger follower, "the second grammarian of Jerusalem."[185]

Whereas *Meʾor ʿayin* is clearly a Hebrew Byzantine translation or continuation of the Karaite Oriental school (or both), the later works of Byzantine Karaites do not follow the typically Karaite system of *simanim*; instead they accept the triliteral theory and system of *binyanim* based on Ḥayyuj.

The Spanish approach to the verb is evident in Judah Hadassi's *ʾEškol ha-kofer*, written in Constantinople in 1148.[186] This monumental encyclopedia of Karaite lore, legal practices, and beliefs is arranged in alphabetical order and contains large sections on linguistics (especially Sections 162–76).[187] It is introduced by a prescription of the study of grammatical categories as a religious obligation for all Karaites and one of the ten principles of faith.[188] Hadassi mentions, as we saw, a book called *Meʾor ʿeinayim* and lists several early Karaite scholars. It is relevant, though, that he did not mention the most famous of them, Abū al-Faraj Hārūn, and was unaware of or oblivious to the early Karaite system of verb inflection. Instead, he adopted the Spanish system of roots and *binyanim*, following closely Abraham Ibn Ezra in his first grammar book, *Sefer Moʾznayim*, written in Rome only eight years before.[189]

Little if any influence of the early Karaite tradition can be detected in the important grammar by the Karaite exegete Aaron ben Joseph ha-Rofeʾ (the Physician) the Elder (ca. 1250–1300), entitled *Kelil yofi* (The Perfection of Beauty).[190] This book follows the Spanish grammatical tradition and bases its description of the verb on the system of *binyanim* (six of them, just as in Ibn Ezra's *Moʾznayim*). As in the case of Judah Hadassi, the Spanish tradition was transmitted chiefly through the works of Abraham Ibn Ezra, whose influence is also evident in the grammatical terminology.[191]

Rabbanite scholars in Byzantium also played an active role in the study of the Hebrew language. An interesting work is *Menorat ha-maʾor* (Lamp of Light) by Joseph ben David ha-Yewani ("the Greek"). Little is known about this author. His name indicates not only his Greek origin, but also the fact that he was probably active elsewhere than in his native land (in Provence?). Dukes, who published some passages of *Menorat ha-maʾor*, placed him in the early thirteenth century. However, the work contains quotations from Judah ben Solomon Ibn Matqa's *Midraš ha-ḥoḵmah* (chiefly its allegorical interpretation of the shape of the Hebrew letters), whose Hebrew version dates from the mid-thirteenth century. The *terminus ad quem* is given by a deed of sale from 1337, found in a manuscript of *Menorat ha-maʾor*.[192]

185 Ibid., p. 18.
186 Editio princeps in Gozlov (Eupatoria), 1836.
187 See Bacher (1896a).
188 *ʾEškol ha-kofer* (1863), f. 21c–d; see Olszowy-Schlanger (1999b), p. 166.
189 Bacher (1896a), p. 69; Zislin (1990), p. 20; Maman (1996b), pp. 95–6. On the influence of Abraham Ibn Ezra, see Zislin (2001).
190 Editio princeps in Constantinople, 1581; ed. in Gozlov (Eupatoria), 1847, by Isaac Trishkan with notes by Isaac ha-Troki.
191 On Abraham Ibn Ezra's special status among Byzantine Karaites, see Frank (1990).
192 Neubauer (1886–1906), No. 1442.

It can therefore be safely assumed that the author lived in the late thirteenth and early fourteenth centuries. *Menorat ha-maʾor* contains an introduction on the Hebrew alphabet of a mystical nature (inspired by the *Midraš ha-ḥok̲mah*), a short grammar, and a biblical Hebrew lexicon arranged alphabetically by triliteral roots (the dictionary is only partly preserved). The short practical grammar quotes the Geonim Saadia, Sherira, and Hai, as well as the Spanish poets Judah Halevi and Moses Ibn Ezra; the major Spanish grammarians Ḥayyūj, Ibn Janāḥ, Abraham Ibn Ezra, Jacob ben Eleazar, and David Qimḥi; and Rashi of Troyes.[193]

A new era of the Hebrew grammatical tradition in Byzantium began with the arrival of immigrants from Spain and Portugal in the second half of the fifteenth century, on the eve of and after their expulsion from Spain (1492) and Portugal (1497). From the beginning of the sixteenth century onward, many important grammatical works were printed in Constantinople, including *Lešon limmudim*, by the Portuguese émigré David Ibn Yaḥya ben Solomon (1455–1528), printed in 1506 (see the following text).

The kabbalist, philosopher, grammarian, and dream interpreter Solomon ben Jacob Almoli (ca. 1485–ca. 1542) was born in Spain or was a son of Spanish parents. Educated in Salonika, some time around 1515 he arrived in Constantinople, where he supported himself as a physician, rabbi, judge, and editor of grammatical texts. He was also the author of a treatise on the schwa, vowels, and nominal patterns, *Halik̲ot šewaʾ* (Ways of the Schwa), written in Constantinople around 1520.[194]

Ashkenaz

It has long been believed that medieval Jewish communities in northern France, Germany, and England were mostly preoccupied with talmudic learning, leaving less scope for the sciences and philology. Over the past twenty years, this view, supported by some polemical statements by Joseph Qimḥi (see the following text), has been challenged with respect to language studies, especially thanks to a series of works by Ilan Eldar.[195] Although only eight grammatical works from medieval Ashkenaz survive (other works and authors are quoted in medieval sources), it now appears that Hebrew linguistics thrived, especially from the mid-twelfth to the end of the thirteenth century. What is more, the work of German and French grammarians and lexicographers is the earliest known example of Hebrew linguistic literature in Europe outside Spain. As we saw, lexicographical works on the Talmud were apparently written in Mainz as early as the first half of the eleventh century.

It should be stressed that the Ashkenazi school of Hebrew linguistics remained under the strong influence of the Oriental tradition, especially in the field of the correct reading of the Bible. This Oriental influence came via the Hebrew translations of the abridged *Hidāyat al-qāri* by Abū al-Faraj Hārūn, brought from Palestine to northern Europe and translated into Hebrew in Mainz, in the twelfth century, under the title *Sefer Horayot ha-qoreʾ*, and later in Italy under the title *Tok̲en ʿEzraʾ* or *Ṭaʿamei ha-Miqraʾ*.[196] These translations were the main source of *ʿEin ha-qoreʾ* by Yequtiel ha-Kohen ben Judah and of *Dark̲ei ha-niqqud ve-ha-neginot* by Moses ben Yom Ṭov of London.[197] Another curious example of northern European Jews' acquaintance with the Oriental linguistic tradition is a short fragment of a grammatical work preserved in a unique manuscript and attributed there to a certain Abraham ha-Bavli (the Babylonian). The work in question consists of only the first six folios, copied together

193 See Dukes (1846), p. 486; Neubauer (1863a), p. 207.
194 Yalon (1944).
195 For an overview, see Eldar (1991, 1993).
196 Wickes (1881); Busi (1984). See Eldar (1992b), p. 71.
197 Löwinger (1929). See Kaufmann (1891); Neubauer (1890), p. 325.

with fifteen other grammatical and literary works, in MS Oxford, Bodl. Or. 135, and dating from the early thirteenth century.[198] Although some scholars believed that Abraham ha-Bavli was indeed the last representative of the once flourishing Babylonian grammatical school,[199] it seems that the Hebrew passages are a translation from the introductory sections of the aforementioned *Kitāb jāmiʿ al-ʾalfāẓ*, the first comprehensive biblical Hebrew-Arabic dictionary, by the Karaite David ben Abraham al-Fāsī (tenth century, Palestine).[200] It must be said, however, that although the translations of the short version of the *Hidāyat al-qāriʾ* were very influential, the work of David ben Abraham (or Abraham ha-Bavli) does not seem to have been used and quoted. Whereas the Palestinian school was prominent in the field of the Masorah and phonetics, the other branches of linguistic literature in Ashkenaz apparently followed different models.

Although he did not write any strictly linguistic works and cannot be described here as a grammarian, Rashi of Troyes (R. Solomon ben Isaac, 1040–1104) did employ grammatical methods in his *peshaṭ* Bible commentaries and quoted various grammarians and lexicographers whose works he used.[201] Rashi is our main source for the early work of Ashkenazi lexicographers, namely the aforementioned lost dictionary by Machir ben Judah (early eleventh century, Mainz): For example, in his commentary on Gen. 43: 11, Rashi consults "alphabetic commentaries" of R. Makhir (ובפירושי א"ב של רבי מכיר) to explain the word בטנים: "I don't know what it is. In the alphabetic commentaries of R. Makhir, I saw 'pistacias.' But I think it might be 'peaches.'" In addition to the early Ashkenazi lexicographers, Rashi's main grammatical sources were Menaḥem ben Saruq and Dunash's rejoinders to him. It is Menaḥem's system, notably his approach to the Hebrew root, that Rashi follows in his commentaries.

The Ashkenazi grammatical works of the French school of Rashi's descendants do not follow Menaḥem's system. Instead they follow an approach to the Hebrew root closer to that of Ḥayyūj, but created independently and probably without knowledge of the latter's works and terminology. The earliest specifically grammatical Ashkenazi work is the *Dayyqot* (or *Dayyaqut*) *le-R. Šemuel* (Grammatical Details of R. Samuel), whose author has been identified with Samuel ben Meir (Rashbam, ca. 1080–after 1158), Rashi's grandson and pupil, better known for his Bible commentary.[202] *Dayyqot* is preserved in a unique, relatively late, manuscript (MS Berlin, Or. Qu. 648, dated 1470) that also contains a masoretic poem by Rabbenu Tam and fragments from the dictionary of Solomon Ibn Parḥon.[203] *Dayyqot* has two parts: a Hebrew grammar and a grammatical commentary on the Bible. The grammar focuses on vocalization and verb morphology. In its approach to the Hebrew root, Rashbam's system differs from Menaḥem's; Rashbam takes the third-person masculine singular perfect *qal* (e.g., כתב) as the derivational base and considers that almost all Hebrew verbs are composed of three consonants. He recognizes verbs he calls חטופים (which correspond to *pe-yod, pe-nun*, and *lamed-he* verbs in Ḥayyūj's system) and remarks that certain consonants of these verbs disappear in the conjugation (he uses the term נחטפים or "taken away, seized"). The only verbs he describes as "bi-consonantal" (הפעלים השניים) are *ʿayin-vav/yod* verbs, because

[198] Neubauer (1886–1906), No. 1466 (Beit-Arié, 1994, No. 1466); Beit-Arié (1985), pp. 632–3.

[199] Hirschfeld (1926), p. 53.

[200] Neubauer (1863b); he had already argued that Abraham ha-Bavli is identical with David ben Abraham al-Fāsī.

[201] See Grossman (2001), pp. 102–5. On Rashi's grammatical approach, see, e.g., Englander (1930, 1939); Pereira Mendoza (1940); Moreshet (1977); Cohen (1941); Van Bekkum (1993); Steiner (1998); Kessler-Mesguich (2006). The passages of Rashi's commentary on the Pentateuch dealing with linguistic matters were collected, probably in the sixteenth century, and printed in 1560 in Riva di Trento, under the title *Sefer Diqduqei Rashi* (Book of the Grammatical Explanations of Rashi); see Heller (2004), Vol. 2, p. 507.

[202] Eldar (1991), p. 6 n. 16; Merdler (1999), pp. 3–4.

[203] Steinschneider (1878), No. 118; Stein (1923); Merdler (1999).

they have only two consonants in the third-person masculine singular perfect *qal* (e.g., קם). However imperfectly, Rashbam arrived at the theory of weak verbs, apparently without being aware of Hayyūj's work.[204]

A very similar approach and grammatical terminology is that of Rashbam's younger brother Jacob ben Meir, known as Rabbenu Tam (ca. 1100–71), the leading tosafist. His only known grammatical work, *Hakraʿot* (Decisions), is essentially a set of grammatical disputes in which he decides between Menaḥem ben Saruq and Dunash Ibn Labrāṭ, usually but not always in favor of Menaḥem. Sometimes, though, he proposes solutions of his own and includes short original ideas, such as the division of verbs into groups (*gezerot*), which make it possible to reconstruct his own grammatical method and notably the theory of consonants called נחטפות ("seized, taken away").[205] The *Hakraʿot* came under criticism from Rabbenu Tam's contemporary and proponent of Spanish school, Joseph Qimḥi, in his *Sefer ha-Galui*, written in 1165 in Narbonne. Rabbenu Tam was in turn defended by his pupil, Benjamin of Canterbury (or Cambridge).

The first Ashkenazi writer acquainted with Ḥayyūj's theory of Hebrew grammar was the author of *ʿEin ha-qore'*, Yequtiel ha-Kohen ben Judah (or Zalman ha-Kohen), who was probably contemporary with Rabbenu Tam. His influential work, preserved in several manuscripts of different origins, quotes a number of Spanish and Ashkenazi sources.[206] There is some uncertainty as to this author's origins and dates. A Sephardi copy of *ʿEin ha-qore'* placed him in Germany, although Elias Levita thought he lived in Prague.[207] As for his dates, most scholars believed he was active in the second half of the thirteenth century, mostly because of the similarity between his ideas and those expressed in thirteenth-century works such as *Darkei ha-niqqud ve-ha-neginot* or *Ḥibbur ha-qonim.*[208] According to Ilan Eldar, however, Yequtiel ha-Kohen, although probably of German origin (as indicated by his name "Zalman"), lived and worked in northern France. Indeed, the Hebrew pronunciation he described in the masoretic part of his work matches that of the Jews of northern France. Eldar identifies him with a certain Yequtiel ben Judah ha-Kohen killed in the Blois massacre of 1171.[209]

ʿEin ha-qore' belongs to the genre of the guides to the correct reading of the Bible and deals with the vowels and accents (*ṭeʿamim*). It contains detailed lists of remarks and corrections of errors common in manuscripts of the Pentateuch, Esther, and Lamentations. According to Yequtiel, his main sources on vocalization were six Spanish exemplars of the Bible, masoretic lists (such as the *Differences between Ben Asher and Ben Naftali*) and above all *Horayot ha-qore'*. As for grammatical sources, he quotes his Ashkenazi predecessors Rashbam, Rabbenu Tam, and Joseph ha-Naqdan (whom he calls "my master," but whose work is not extant), as well as the Spanish authors Ḥayyūj, Ibn Janāḥ, and Ibn Parḥon (whose Hebrew *Maḥberet he-ʿaruk* was probably Yequtiel's source for Ḥayyuj and Ibn Janāḥ: The latter's works were not translated into Hebrew until 1171, which is the year of Yequtiel's death, if Eldar is right).[210]

[204] Eldar (1991), p. 8.

[205] Filipowski (1855) – from MS Oxford, Bodl. Opp. 627. Englander (1940) considered that Rabbenu Tam closely followed Menaḥem's approach to the Hebrew root (p. 485). For the description of Rabbenu Tam's approach and a comparison with Rashbam's grammar, see Eldar (1991), p. 10. Englander (1940, p. 485) argued that Rabbenu Tam did not propose triliteral roots for weak verbs, but his arguments (based on an erroneous interpretation of the term נחטף) are not convincing.

[206] Hirschfeld (1926), App. III – from MS Brit. Lib. Or. 853; Gumperz (1958), pp. 36–47 and 137–46 (one chapter); Yarkoni (1985); Eldar (1976); Eldar (1978), Vol. 1, pp. 191–6.

[207] See Eldar (1976), pp. 190, 191; (1991), pp. 10–11.

[208] Téné (1971), col. 1387; Yarqoni (1985), p. iii; see Eldar (1991), p. 11.

[209] See Eldar (1976), p. 192 n. 10. Eldar (1991, pp. 12–13) quotes Efraim ben Jacob of Bonn, who wrote in his *Sefer Zekirah* that Yequtiel ha-Kohen was a disciple of Rashbam's and Rabbenu Tam's.

[210] Eldar (1991), p. 13; the single mention of Abraham Ibn Ezra and of David Qimḥi seems to be a later interpolation.

Another representative of this genre is *Darkei ha-niqqud ve-ha-neginot*, by Moses ben Yom Ṭov ha-Naqdan of London, written circa 1250 and preserved in several manuscripts.[211] His main source was *Sefer Ṭaʿamei ha-Miqraʾ*, an Italian translation of the *Hidāyāt al-qāriʾ*, together with Rashbam, Moses Roti (a massorete whose work is not preserved[212]), Rashi, Menaḥem ben Saruq, Dunash Ibn Labrāṭ, Ḥayyūj, Ibn Janāḥ, and Ibn Parḥon. The work deals mainly with the vowels and accents, but it also contains discussions of Hebrew verb morphology, following the system of Ḥayyūj. Indeed, according to his disciple, Moses ben Isaac ben ha-Nessiʾah of London, Moses ben Yom Ṭov was the first northern grammarian to accept Ḥayyūj's system. Moses ha-Naqdan has also been credited with the detailed comments on Joseph Qimḥi's *Sefer ha-Zikkaron.*[213]

The classical Spanish tradition of Ḥayyūj and his followers was also accepted by Moses ben Isaac ben ha-Nessiʾah, who can be considered to be the most accomplished Ashkenazi grammarian of the Middle Ages. By his own account, in his youth he wrote a Hebrew grammar called *Lešon limmudim*, which is no longer extant. He is known by his second work, *Sefer ha-Šoham* (The Onyx Book, שהם, "onyx" being an anagram of משה, Moses), a comprehensive grammar and dictionary of the Hebrew Bible, written around 1260 in London and preserved in two manuscripts.[214]

This grammatical and lexicographical compendium begins with an overview of Hebrew grammar, containing a detailed description of the consonants according to their phonetics and functions and a section on the use of grammar and syntax in biblical exegesis. The main part of the work is organized as a dictionary, subdivided in an unusual fashion, into sections according to the three parts of speech (verbs, nouns, and prepositions). The verbs are arranged alphabetically by roots and according to the *binyanim* in which they are actually attested. Moses ben Isaac distinguishes eight *binyanim*: *paʿal, nifʿal, piʿel, puʿal, hifʿil, hofʿal, hitpaʿel*, and *merubbaʿ*. The different *gezerot* – types of weak verbs – are also considered separately. It is worth mentioning that the terminology to describe weak verbs echoes in part that of the Ashkenazi school, namely Rashbam and Rabbenu Tam (weak verbs are called נחטפים). The noun section is subdivided by *mišqalim* (nominal patterns), and their lists echo David Qimḥi's division, with attested nouns listed alphabetically under each subheading. The section on prepositions is also arranged as an alphabetic dictionary. The last section of the *Sefer ha-Šoham* is devoted to the vowels and biblical accents. The Hebrew section is followed by an appendix with a dictionary of biblical Aramaic.

Sefer ha-Šoham is clearly one of the most comprehensive and important medieval descriptions of the Hebrew language. It offers an original structure and in-depth analysis of a range of linguistic phenomena and quotes an impressive array of scholars, both from Spain and from Ashkenaz. It mentions Menaḥem ben Saruq, Ḥayyūj, Joseph Qimḥi's *Sefer Zikkaron*, Solomon Ibn Parḥon's *Maḥberet he-ʿaruk*, and *Sefer ha-Haśśagah*, Obadiah ha-Sefaradi's Hebrew version of Ibn Janāḥ's *Kitāb al-mustalḥaq*. One of its main sources, however, was David Qimḥi's *Sefer ha-Šorašim*. Moses ben Isaac probably did not know Arabic and was acquainted with the works of Spanish grammarians writing in Arabic through the Hebrew translations. It seems furthermore that he did not have access to the translations of the main works of Ibn Janāḥ and knew them through Ibn Parḥon and Qimḥi. It is also likely that he had only secondhand

211 Löwinger (1929). See Dotan (1971).

212 See Wilensky (1936), pp. 647–9.

213 See Bacher (1888).

214 A large part of the first section (verbs) of the dictionary was edited twice: by Collins (1883) – from MS St. Petersburg, Firkovich Evr II A 34 – and by Klar (1947), with the introduction by C. Roth, from the Oxford manuscript Bodl. Opp. 152 (Neubauer, *Catalogue*, No. 1484).

knowledge of Saadia Gaon and Maimonides, whom he quotes a few times. Moses ben Isaac also quotes a large number of Ashkenazi grammarians and exegetes, some of them unknown from other sources. In addition to Rashbam, Rabbenu Tam, Moses Roti, his teacher Moses ben Yom Ṭov of London, Berachiah ha-Naqdan,[215] Rashi, Eliezer of Beaugency, and Joseph Qara, he mentions a certain Jacob of Tchernichov, a Jew from Russia, and a Christian convert to Judaism, Joḥanan, whom he describes as an excellent grammarian.[216] The St. Petersburg manuscript contains many glosses introduced by the scribe, a certain Aaron, which quote grammatical teachings of the English tosafist Elijah Menaḥem, who was Moses ben Isaac's fellow pupil and the son of Moses ben Yom Ṭov.

Samson ha-Naqdan's *ha-Šimšoni* (after its author, but also known as *Ḥibbur ha-qonim*), written in Germany and preserved in at least five manuscripts, probably dates from the second half of the thirteenth century.[217] This comprehensive grammar opens with a section on independent and suffixed pronouns (called קונים) and continues with sections on verbs (by *gezerot*), nouns (by *mišqalim*), vowels, rules of vocalization, guttural and the *beged kefet* consonants, the *meteg*, biblical accents, and the *dagesh qal*. The author mentions many grammarians and masoretic sources, including Spanish books (probably model Bible codices), the *Differences between Ben Asher and Ben Naftali*, Saadia Gaon, Ḥayyūj, Ibn Janāḥ, Samuel ha-Nagid, Moses Ibn Gikatilla, Jacob ben Eleazar,[218] several works by Abraham Ibn Ezra, Solomon Ibn Parḥon, Joseph and David Qimḥi, *ʾEven boḥan* (perhaps by Menaḥem ben Solomon of Rome), as well as Ashkenazi authors such as Rashbam, Joseph ha-ḥazan of Troyes, and Moses Roti.[219]

Ḥibbur ha-qonim was the model for a short pedagogical grammar dealing with paradigms of the Hebrew verbs, entitled *Mafteaḥ šel diqduq* (Key to Grammar).[220] Effectively an abridgment of *Ḥibbur ha-qonim*, and often found copied together with it in medieval manuscripts, *Mafteaḥ šel diqduq* was sometimes considered to be a second work by the author of *Ḥibbur ha-qonim*. From the attribution in one manuscript of the *Mafteaḥ* (MS Vatican ebr. 296, fifteenth century), however, it seems that its author was a certain Mordecai Yaʾir, active in Germany at the end of the thirteenth century, the same grammarian who produced and annotated the copy of *Ḥibbur ha-qonim* in MS Brit. Lib. Or. 1016.[221]

Ḥibbur ha-qonim and the *Mafteaḥ šel diqduq*, together with the works of some French and English authors (notably Moses ben Yom Ṭov), were used by a certain R. Senior (or Shneor) from France or Germany (late thirteenth to early fourteenth century?), the author of a grammatical compilation preserved in a single manuscript (MS Bodl. Opp. 31[222]); the bulk of it is devoted to the rules of vocalization and biblical accents.[223]

Hebrew–Old French biblical glossaries are an important aspect of the linguistic tradition in northern Europe. Six glossaries and many additional fragments, often recovered from

[215] Probably identical with the author of the *Fox Tales* and various commentaries, but whose strictly grammatical work is not known.

[216] See Roth in Klar (1947), p. viii.

[217] See Eldar (1978–9; edition of the chapter on the vowels), pp. 201–10; Ben-Menahem (1987; chapters on suffixes and verb); see also Geiger (1844). For a description of the manuscripts, see Eldar (1978–9), pp. 107–8; Eldar (1991), p. 28 n. 123.

[218] Probably the twelfth-century author of *al-Kāmil* (The Complete Book), mentioned by David Qimḥi as *Sefer ha-Šalem*.

[219] Eldar (1978–9), pp. 108–9.

[220] Melchior (1923).

[221] This manuscript also contains a copy of *Mafteaḥ ha-diqduq*, copied by the same hand. See Eldar (1978–9), p. 107; Eldar (1991), p. 28.

[222] Neubauer (1886–1906), No. 1484.

[223] Eldar (1991), pp. 30–2.

book bindings, have been identified so far.[224] Most of them are anonymous; all date from the thirteenth century but reflect an earlier tradition related to Bible study and interpretation in northern France, with some links to the French glosses in the commentaries of Rashi and his school.[225] The glossaries are arranged according to the order of the biblical books. The Hebrew lemmata (chosen for their lexical, grammatical, or exegetical difficulty) are translated into a French vernacular dialect (e.g., Champenois in the Basel glossary, Anglo-Norman in the Leipzig glossary). The translations are usually followed by biblical quotations that illustrate the meaning of the word through its context. In most glossaries, the words are provided with short commentaries, which often include the ideas of earlier grammarians, mentioned by name. The Leipzig glossary refers to, inter alia, Menaḥem ben Saruq, Dunash Ibn Labrāṭ, Ḥayyūj, Ibn Janāḥ, R. Makhir (in a quotation from Rashi), Rashi, Abraham Ibn Ezra, Rashbam, Rabbenu Tam, Ibn Parḥon, Berachiah ben Natronai ha-Naqdan, and a certain R. David, whom Banitt identified with David Qimḥi.[226] The Leipzig glossary, copied in England or Normandy by the end of the thirteenth century, constitutes a veritable lexicographical and grammatical compendium, which was enhanced, in the early fourteenth century, by Old German glosses inscribed in the margins.

Italy

The earliest linguistic work written in Italy is the first systematic dictionary of talmudic language and literature, the *ʿAruḵ*, compiled between 1070 and 1101 by Nathan ben Jeḥiel of Rome (ca. 1035–1106).[227] Nathan studied in Rome with his father, the head of Rome's Jewish Academy, in Sicily, and later in Narbonne, under Moses ha-Darshan, with whom he apparently learned the Gaonic method of talmudic interpretation. The *ʿAruḵ* is more of a talmudic encyclopedia than a lexicographical work. Together with explanation of difficult Hebrew and Aramaic words in the talmudic and midrashic literature, often supported by etymologies from Latin, Greek, Italian, Arabic, and Persian, Nathan also provided interpretation of the passages in which these words are found as well as commentaries on legal rules and customs. He quoted Menaḥem's *Maḥberet* as well as the commentaries of Hai Gaon and the Ashkenazi exegetes of the Mainz school, but he did not mention the *Alfa Beta de-Rabbi Maḵir*. Though written at the end of the eleventh century, the *ʿAruḵ* still follows the pre-Ḥayyuj approach to the roots, considering that some words have one or two radical letters only.[228] Soon after its appearance, the *ʿAruḵ* became influential in both Spain and northern Europe, where it was an important lexicographical source for the tosafists. This comprehensive work was very popular and was very often copied and later printed. In fact, it was one of the first Hebrew books to appear in print, before 1480 in Italy (an enlarged and corrected version by Benjamin Musafia was printed in Amsterdam in 1655), and several times in an abridged version (*Qiṣṣur he-ʿAruḵ*), first in 1511, in Cracow.

[224] For the list, see esp. Darmesteter (1872); Lévy (1964); and Banitt (1967), pp. 191–2. Three glossaries have been edited so far: MS Paris BNF héb. 302 (copied in 1240, one of the earliest of the Old French glossaries) by Lambert and Brandin (1905); MS Basel, A III 39 by Banitt (1972); and MS Leipzig (Cat. Vollers) V 1099, by Banitt (2005). See also Banitt (1961).

[225] See Darmesteter (1909); Darmesteter and Blondheim (1929); Blondheim (1937); Banitt (1986). According to Banitt, the glossaries reflect an ancient vernacular translation of the Bible used by the Jews in medieval France; see Banitt (1981); also see Banitt (2005), pp. 19–20.

[226] See Banitt (2005), pp. 405–17.

[227] Kohut (1878–92). See Abramson (1964, 1972, 1973, 1974, 1984).

[228] See Ta-Shma (2002), p. 115.

In 1143, in Rome, Menaḥem ben Solomon wrote *ʾEven boḥan* (Touchstone),[229] a dictionary of biblical Hebrew preceded by a short grammar and also containing a chapter on exegesis. In its grammatical approach, this twelfth-century work still follows, with several corrections and additions, the works and grammatical approach of Menaḥem ben Saruq and of Nathan ben Jeḥiel and does not seem to be influenced by Abraham Ibn Ezra, who worked in Rome at the same time.

The achievements of Spanish grammar reached Italy after Spanish scholars settled there, roughly at the time of Menaḥem ben Solomon's activity. Sometime between 1140 and 1142, in Rome, the exegete and scientist Abraham Ibn Ezra (Tudela, 1089–England, 1164)[230] wrote his first book of Hebrew grammar, *Sefer Moʾznayim*.[231] Written in Hebrew, this introduction to grammar opens with a list of the Hebrew grammarians of the past and a definition of fifty-nine grammatical terms.[232] Together with his translations of the three aforementioned works of Ḥayyūj (as *Sefer ʾOtiyyot ha-naḥ*, *Sefer Poʿolei ha-kefel*, and *Sefer ha-Niqqud*), *Sefer Moʾznayim* was essential in fixing the terminology of Hebrew grammar[233] and was very influential, notably in Byzantium. Slightly later, perhaps after he moved to Lucca,[234] Ibn Ezra wrote a small polemical treatise to defend Saadia Gaon against the criticisms of Dunash Ibn Labrāṭ. This work was printed in 1843 under the title of *Śefat yeter*,[235] the title found in the introductory poem copied with this polemical work. However, according to Wilensky,[236] *Śefat yeter* was the title of another work by Ibn Ezra, a comprehensive but simple Hebrew grammar for elementary teaching, written in Lucca sometime between 1142 and 1145, which Wilensky considered as no longer extant. According to Bacher and Hirschfeld, this elementary grammar was called *Yesod ha-diqduq* (Foundation of Grammar), but Bacher suggested that both the defense of Saadia and the elementary grammar might have originally been part of the same work.[237] Today the defense of Saadia (still called *Śefat yeter*) is considered to be separate from the grammar. A grammar entitled *Yesod ha-diqduq* was finally identified and published by Allony under the compromise title *Yesod diqduq huʾ Śefat yeter*.[238] According to Del Valle, however, the grammar written in Lucca was yet another work, *Sefer ha-Yesod* (Book of Foundation), mentioned by Ibn Ezra in his other books, which seems to be lost today.[239] To sum up, during his stay in Lucca, Abraham Ibn Ezra probably wrote three grammatical works: the defense of Saadia Gaon (published as *Śefat yeter*), a grammar (published as *Yesod ha-diqduq huʾ Śefat yeter*), and another grammar, no longer extant, that was entitled either *Sefer ha-Yesod* or *Śefat yeter*. In October 1145, in Mantua, Ibn Ezra completed his grammatical opus magnum, *Sefer Ṣaḥut* (Book of Correctness).[240] A separate section of this work is devoted

[229] Dukes (1846), No. 2.

[230] A recent analysis of Abraham Ibn Ezra and his grammatical works and theories is provided by Del Valle Rodríguez (1977); Charlap (1999).

[231] Heidenheim (1791); Jiménez Patón and Sáenz-Badillos (2002); also see Bacher (1882a).

[232] See Del Valle Rodríguez (2000b).

[233] For the lexicon of Abraham Ibn Ezra's grammatical terms and their sources, see Prijs (1950).

[234] For the chronology of Abraham Ibn Ezra's works, see Sela and Freudenthal (2006).

[235] Lippmann (1843).

[236] For the identification of the work, see Wilensky (1927), pp. 83–7.

[237] Bacher (1882a), p. 16. For a summary of the difficulties of identification and a bibliography, see Charlap (1999), p. 7 n. 25; Del Valle Rodríguez (2001).

[238] Allony (1985).

[239] Bacher (1882a), pp. 8–17; Hirschfeld (1926), p. 73, where he quotes MS Cod. Montefiore 316 (Hirschfeld, Descriptive Catalogue, No. 404). Del Valle analyzed a grammar partly preserved in a fifteenth-century manuscript (Paris, BNF, héb. 1239, ff. 145–7) with the title *Sefer ha-Yesod le-Rabbi Avraham ben Ezra* and concluded that it is not the lost work by Abraham Ibn Ezra; see Del Valle Rodríguez (1996), pp. 405–6.

[240] Lippmann (1827); Del Valle Rodríguez (1977b).

to the phonetics, written shape, and system of the Hebrew vowels. Other sections deal in detail with nouns, numbers, and verbs, and they provide a wealth of exegetical comments in addition to the grammatical information. A year later, in Verona, he wrote his last strictly speaking grammatical work, *Sefer Śafah berurah.*[241] The works of Ibn Ezra's Italian period had an important impact on the further development of Hebrew linguistics in that country. We know that he had disciples, such as Benjamin ben Joab Anau (Degli Mansi), who, however, did not write a grammar; the later linguistic literature by Italian authors bears a mark of Ibn Ezra's terminology and method. After he left Italy for southern France, Ibn Ezra wrote three other books dealing at least in part with grammar (see later text).

Another Spanish émigré active in Italy was Solomon Ibn Parḥon. After studying with Judah Halevi and Abraham Ibn Ezra, Ibn Parḥon settled in Salerno. Struck by the ignorance of the Spanish approach to grammar in his new homeland, in 1161 he wrote a comprehensive dictionary of biblical Hebrew, introduced by a short Hebrew grammar.[242] This work is largely a Hebrew adaptation of Ḥayyūj and Ibn Janāḥ, but it also contains many original ideas. It was written to supercede the two main linguistic sources used by Italian Jews at the time – Menaḥem's *Maḥberet* and the *ʿAruḵ*; significantly, it bears the title *Maḥberet he-ʿAruḵ*. While proposing a new approach and classifying his dictionary by trilateral roots (with separate lists of four- and more-lettered roots at the end of each alphabetical chapter), Ibn Parḥon addressed Menaḥem's and Nathan's ideas and made extensive use of rabbinic sources in his explanation of biblical roots.

The Spanish approach to Hebrew grammar is also predominant in later Italian linguistic literature. Such is the case with two grammar textbooks, the *Haqdamah* (Preface) and *Mavoʾ ha-lašon* (or *Mavoʾ ha-diqduq*; Introduction to Language, or Grammar) written around 1300, probably in Rome, by Benjamin ben Judah Bozecchi, who was related to the Anau family.[243] His teacher, Joab ben Benjamin Anau, was described as a grammarian, although his works are not known.

Almost contemporary was Immanuel ben Solomon of Rome (ca. 1260–1328). Better known for his poetry, his introduction of the Italian sonnet form into Hebrew verse, and his contacts with Dante Alighieri,[244] Immanuel was also a skilled grammarian. His *ʾEven boḥan* (Touchstone) is primarily intended as an exegetical aid, but many of its 175 chapters deal with orthography and grammar, and notably with word derivation and techniques of interpretation, such as the permutation, exchange, omission, or addition of consonants.

During the fourteenth century, the grammatical tradition in Italy was influenced by the works of the Qimḥi family (see the following text). Their works, especially the pedagogical writings by Moses Qimḥi, were often copied and imitated in Italy. An interesting example of such an Italian adaptation is a Judeo-Italian translation of the verb paradigms from Moses Qimḥi's *Mahalaḵ ševilei ha-daʿat* (preserved in MS Vatican ebr. 435) by an unidentified fourteenth-century Roman scholar.[245]

This Italian translation of the verb paradigms is a sign of a growing tendency to study Hebrew in the vernacular. Already in the mid-thirteenth century, Moses of Salerno wrote a

[241] Lippmann (1839); Wilensky (1924); Ben-Menahem (1941); Ruiz-Gonzalez and Sáenz-Badillos (2004). See Bacher (1882a), pp. 25–6.

[242] Stern (1844). See Bacher (1890b, 1896b).

[243] The *Haqdamah* was published together with Moses Qimḥi's *Mahalaḵ ševilei ha-daʿat*, in Pesaro in 1508 and again at the Bomberg press in Venice in 1546 (edited by Elias Levita in the grammatical anthology *Diqduqim*). For the identity of the author of the *Haqdamah* and *Mavoʾ*, see Bacher (1885), pp. 123–44. See also Del Valle Rodríguez (1973); Sáenz de Zaitegui Tejero (2000).

[244] See Chotzner (1891–2).

[245] Sermoneta (1967).

Hebrew-Italian dictionary of philosophical terms from Maimonides' *Guide of the Perplexed*.[246] The most popular Hebrew-Italian work is the *Maqreʾ dardeqei* (Children's Reader), which is known in several different versions and attributed to a certain Pereṣ Trabot (or Trevot). It was first compiled at the turn of the fourteenth and fifteenth century – certainly after the expulsion of the Jews from France in 1396, which it laments – perhaps in southern Italy (the author seems to have known Arabic).[247] *Maqreʾ dardeqei* is a multilingual elementary glossary, with biblical Hebrew lemmata translated into Italian and Arabic; however, it often also quotes the Old French glosses of Rashi and the Provençal glosses from David Qimḥi's *Šorašim*. Indeed, Qimḥi's dictionary was the model for the arrangement of the *Maqreʾ dardeqei*, and Rashi was one of its sources. There were also later Spanish versions of the work.[248] The aim of the dictionary, as expressed in the introduction, is to assist the study of Hebrew and biblical exegesis, but also polemics with the Christians. This popular work appeared in print as early as 1488, in Naples.

In 1429, Joseph ben Judah Zarco (probably a disciple of Profiat Duran's, active in various Italian towns at the beginning of the fifteenth century, and notably in Pisa and Mantua, where he enjoyed the patronage of the bankers and bibliophiles Isaac and Mordecai Finzi) wrote a grammar of the Hebrew verb under the title *Rav Peʿalim* (punning on "Doer of Great Deeds," after 2 Sam. 23:20, or 1 Chron. 11:22, and "Master of Verbs")[249] and a comprehensive dictionary, *Baʿal ha-lašon* (Master of Language), modeled to a large extent on David Qimḥi's *Šorašim*.

A major work is *Livnat ha-sappir* (A Pavement of Sapphire; Exod. 24:10), by the physician, philosopher, and grammarian Judah ben Jeḥiel (Messer Leon), written in 1454. This comprehensive grammar in 122 chapters is divided into two parts, one dealing with pronunciation and prosody and the other with nouns and verbs. Judah ben Jeḥiel was inspired by Abraham Ibn Ezra, and especially by his treatment of the vowels in *Sefer Moʾznayim*, as well as by Profiat Duran's linguistic philosophy (see later text). In the best Aristotelian tradition of Italian humanists, he also wrote the first Hebrew treatise on rhetoric, *Nofet ṣufim* (The Sweetness of Honey), in which he attempted to adapt to Hebrew the theories and terminology of the classical rhetoricians Cicero and Quintillian.[250]

In 1480, Solomon ben Abraham of Urbino wrote a dictionary of Hebrew synonyms entitled *ʾOhel moʿed* (Tent of Meeting).[251] This is a concise list of Hebrew synonyms with biblical references, along with some more extensive semantic discussions.[252]

Moses ben Shem Ṭov Ibn Ḥabib[253] came from Lisbon; after a short stay in Palestine, he settled in Italy, where he composed his linguistic works. In Naples, in 1484, he finished his earliest book *Peraḥ šošan* (Flower of the Lily), a fairly comprehensive grammar covering verb and noun categories. Along with Ḥayyūj, Ibn Janāḥ, and Abraham Ibn Ezra, its main source was *Maʿaśeh ʾefod* by Profiat Duran. *Peraḥ šošan* had some influence, because it was quoted frequently by Abraham de Balmes in his *Miqneh ʾAvram*, but it was never printed and survives today in a single manuscript.[254] Much more popular was another shorter grammar by Ibn Ḥabib, a summary of the main principles of the Hebrew grammar under the ambitious title *Marpeʾ lašon* (The Healing of Language; Prov. 15:4), printed in Constantinople in 1520 and

246 Sermoneta (1969).
247 On the Arabic in *Maqreʾ dardeqei*, see Schippers (2001).
248 Hary (1999).
249 Printed in Amsterdam, in 1730.
250 Editio princeps in Mantua, before 1480; see Rabinowitz (1983).
251 Hirschfeld (1926, p. 97) mistakingly calls it a dictionary of homonyms.
252 Editio princeps in Venice, 1548. See Dukes (1881).
253 Bacher (1892), pp. 100, 113.
254 MS Brit. Lib., Margoliouth 2857.

later included in Elias Levita's collection *Diqduqim*, printed in Venice in 1546.[255] Printed along with *Marpeʾ lašon* was Ibn Ḥabib's treatise on Hebrew poetics, based on Aristotle, *Darḵei noʿam* (Pleasant Ways). Although not, strictly speaking, a work on grammar, it contains many references to grammatical texts and especially to *Peraḥ šošan*.

A truly exceptional work, marking the end of the medieval period, is *Miqneh ʾAvram* (The Flock of Abram; Gen. 13:7) by Abraham ben Meir de Balmes (ca. 1440–1523), a physician and a teacher at the Padua medical school, talmudic scholar, and translator of Arabic philosophical works into Hebrew and Latin. While living in Venice and serving as personal physician to Cardinal Domenico Grimani, Balmes became involved with Daniel Bomberg's press. His grammar, *Miqneh ʾAvram*, written at Bomberg's request, appeared in Venice in 1523, after the author's death.[256] The book went to press incomplete: The last chapter, on Hebrew vowels, was completed by Balmes's friend and colleague Qalonymos ben David (known also as Calo Calonimo), who also completed the Latin translation, which was printed together with the Hebrew original under the title *Peculium Abrae*. Note that *Miqneh ʾAvram* is a comprehensive and highly theoretical Hebrew grammar, with philosophical definitions of grammar and its principles, largely inspired by the Aristotelian tradition. It is exceptional in that it devotes considerable attention and a whole chapter to syntax. Its methods and terminology are reminiscent of medieval Latin speculative grammar. The grammar is divided into eight main sections: The first three deal with pronunciation, the rules of exchange of consonants, and vocalization; the next three deal with the parts of speech – nouns (he defines 311 noun formations), verbs, and particles; the seventh section focuses on syntax.

Elias Levita (Elijah Baḥur; Neustadt, 1469–Venice, 1549) was undoubtedly the most prolific and famous author of grammatical works in the early sixteenth century. Through their Latin translations, Levita's grammatical, lexicographic, and masoretic works became the basis for modern Semitics and biblical criticism.[257] He was both an excellent teacher of elementary Hebrew (first to Jewish children and later to the most eminent Italian, German, and French Christian Hebraists) and a remarkable scholar who wrote both Hebrew primers and more detailed linguistic tractates. He also edited and commented on the works of the Qimḥis. Levita was born in Germany but arrived in Italy in his youth. He first settled in Venice and later in Padua, where by 1504 he was a Hebrew instructor to Jewish families.

During his stay in Padua, he prepared an annotated edition of Moses Qimḥi's *Mahalaḵ ševilei ha-daʿat* and of *Petaḥ devarai* (which Levita wrongly attributed to David Qimḥi). This was printed by Soncino at Pesaro, in 1507/8, but without due credit to Levita: This edition of Moses Qimḥi appeared without mention of Levita; to add to the confusion, it was prefaced by an introduction attributed to the aforementioned Benjamin ben Judah Bozecchi Anau.[258] The omission of Levita's name was not corrected in either the second Soncino edition in Pesaro in 1517 or in the 1519 Ortona edition.[259] He is identified as author of the commentary in Sebastian Münster's Latin translation of the work, published by Andreas Crantander in Basel in 1531. The first Hebrew edition crediting Levita was published by the Bomberg press in Venice in 1546 as part of Levita's edition of four Hebrew grammatical works: Ibn Ezra's *Moʾznayim* and *Ṣaḥot*, *Petaḥ devarai*, and *Mahalaḵ ševilei ha-daʿat*.

In 1509 Levita left Padua and settled in Rome, where for thirteen years he was a Hebrew teacher and protégé of the humanist Cardinal Egidio da Viterbo, who also taught Levita

[255] It was printed later, in Prague, in 1785 by Avigdor ben Simḥah ha-Levi of Glogau.

[256] See Campanini (1997).

[257] Weil (1963).

[258] For the identity of the author of the *Haqdamah*, see Bacher (1885), pp. 123–44. See also Del Valle Rodríguez (1973); Sáenz de Zaitegui Tejero (2000).

[259] See Talmage (1975), p. 8.

some Greek. During his stay in Rome, Levita wrote four works on the Hebrew language: *Sefer ha-Harkavah* (Book of Compounding), a short tractate on foreign and compound words in Hebrew, written in 1517, and printed by Daniel Bomberg in Venice in 1546; *Sefer ha-Baḥur* (a pun on his surname), a comprehensive grammar, dedicated to Egidio da Viterbo, covering all the grammatical categories in four parts, each subdivided into thirteen sections to match the thirteen Maimonidean principles of the Jewish faith (the total of fifty-two is the numerical value of the author's name, Elijah), published in 1518 (reissued in Isny in 1542); a table of verb paradigms, *Luaḥ be-diqduq ha-peʿalim ve-ha-binyanim*; and *Pirqei ʾEliyahu* (Chapters of Elijah), printed in 1520 (reissued in Venice in 1546), a collection of detailed articles on selected grammatical subjects, written partly in verse, which are an in-depth supplement to the topics treated only briefly in his previous works. In 1527 Levita returned to Venice, where he worked as a proofreader at Daniel Bomberg's press and edited grammatical works such as the 1529 edition of David Qimḥi's *Sefer Šorašim.* In Venice, Levita continued to teach Hebrew to distinguished Christian Hebraists. Starting in 1525, Levita was associated with Sebastian Münster, who translated Levita's grammatical works into Latin and published them.[260]

In Venice, Levita continued his important work on the Masorah. The financial support of the French ambassador, Georges de Selve, allowed Levita to complete (in 1536) his magnum opus, the comprehensive masoretic concordance *Sefer Zik̲ronot* (Book of Remembrance), on which he had worked for some twenty years. De Selve sent the manuscript to Paris to be printed. It was never published, however, and is still available only in the autograph manuscript at the Bibliothèque Nationale de France. However, it was well received in Paris and gained Levita an invitation from François I to become professor of Hebrew at the newly founded Collège Royal (Levita declined). The second book on the Masorah, *Masoret ha-masoret* (The Tradition of the Masorah), was printed in 1538 and had tremendous success. A year later it was reprinted in Basel, this time with a partial Latin translation by Sebastian Münster.[261] This short book is divided into three parts, each subdivided into ten sections to represent the ten commandments and with its own separate introduction: "The First Tables," on plene and defective spelling in the Bible; "The Second Tables," on ketib and qere, the vowels, the *dagesh*, *rafeh*, and *mappiq*; and "The Broken Tables," on masoretic abbreviations. In the introduction to the third part, Levita advanced a number of arguments in favor of the late, post-talmudic origin of the vowel points (contrary to the prevalent belief that the vowel points were of ancient origin, if not indeed contemporary with the consonantal text). This late attribution caused an outcry among the more orthodox (even though the late origin of the vowel points is discussed frequently in medieval literature). However, it was a real revolution for Christian Bible criticism, sparking a *pugna punctorum* that lasted for some three centuries and divided Christian Hebraists into the proponents and opponents of the early date of the vowel points (the two attitudes corresponded to Catholic and Protestant approaches and became one of the key theological issues between the two groups). *Masoret ha-masoret* was followed the same year, 1538, by a short treatise on the biblical accents, *Ṭuv ṭaʿam* (Good Sense; Ps. 119:66).

Together with his work on the Masorah, Levita also engaged in lexicography. When Daniel Bomberg's press closed, Levita left in 1540 for Isny (and later Constance) to manage the press newly opened by Paul Fagius, who was professor of Hebrew in Strasbourg and later in Cambridge. *Tišbi*, a dictionary with definitions of 712 words (the numerical value תשבי, the gentilic of the prophet Elijah), most of them taken from the rabbinic literature (the Talmud, *Genesis Rabbah*, and Midrash *Yelammedenu*), and intended to fill in lacunae

[260] *Sefer ha-Diqduq* (Basel, 1543); *Sefer ha-Baḥur* (Basel, 1543); *Sefer ha-Harkavah* (Basel, 1525); *Pirqei ʾEliyahu* (Basel, 1527).

[261] See Ginsburg (1867).

in earlier dictionaries, such as the *ʿAruḵ*, was printed in Isny in 1541.[262] *Tišbi*'s definitions contain references not only to Hebrew and Aramaic but also to Arabic, Greek, Latin, German, and Yiddish. *Tišbi* was published in Hebrew and simultaneously in a bilingual Hebrew-Latin edition, with the translation by Fagius. A dictionary of the Aramaic parts of the Bible and of the targumim, the *Meturgeman* (The Translator), organized according to the roots arranged alphabetically,[263] was also published in 1541, followed the next year by a list of Hebrew technical terms, *Šemot devarim* (Names of Things).

Provence

The influence of the Spanish school in southern France is linked to Abraham Ibn Ezra's brief residence there and his contemporary Joseph Qimḥi's settlement in Narbonne. Before that time, Provençal scholars had been in the sphere of influence of the school of northern France. After he left Italy, around 1150, Abraham Ibn Ezra spent several years in Provence, where he wrote *Yesod mispar*, which, although not a grammatical work, includes linguistic sections on numerals (written before 1155, in Béziers),[264] as well as *Sefer ha-Šem ha-nikbad*, essentially a work on the divine names but containing several grammatical sections dealing with names and adjectives.[265] This work was influential; several abridgments were made, which were sometimes confused with Ibn Ezra's own works.[266]

During his stay in Provence, Ibn Ezra could have encountered another prominent émigré from Muslim Spain, Joseph ben Isaac Qimḥi (ca. 1111–ca. 1170), who settled in Narbonne around 1150. An exegete, poet, translator from Arabic,[267] and anti-Christian polemist, Joseph Qimḥi insisted on the necessity of in-depth knowledge of Hebrew grammar for biblical exegesis, especially of the *peshat* type he advocated, and wrote two grammatical works. The first, *Sefer Zikkaron*, is a grammatical overview of the Hebrew language. It deals with the consonants, their pronunciation and function, rules of word formation, the definition of the three parts of speech, noun patterns, the numerals, parsing verbs and finding their root, the *binyanim* of regular and weak verbs, and the vowels.[268] It has been suggested that *Sefer Zikkaron* is similar in scope to Ibn Ezra's *Sefer Ṣaḥut*.[269] It is also important to note that, for the paradigms of regular verbs, Joseph Qimḥi used the root שמר, which is also the model verb employed by Ibn Ezra. The most original and long-lasting contribution of *Sefer Zikkaron* is its treatment of the vowels. Instead of the qualitative list of seven vowels (*melakim* or "kings") found in the masoretic literature and accepted by previous grammarians, Joseph Qimḥi proposed a coherent system of ten vowels, five qualities (a, e, i, o, and u), each with two quantities (long and short). This division of the vowels into pairs of long and short provided the basis for a definition of the syllable and the rules concerning the schwa and the *beged kefet* letters, which were accepted by his sons, Moses and David, and are still employed in Hebrew grammars and manuals today.

In 1165 Joseph Qimḥi wrote *Sefer ha-Galui*, an alphabetically arranged polemical answer to the *Hakraʿot* by his contemporary Rabbenu Tam.[270] In the first part of this book, Joseph Qimḥi offers his own decision on the points disputed by Menaḥem ben Saruq and Dunash

[262] It contains, however, words that appear in the work of Nathan ben Jeḥiel or in the dictionary of David Qimḥi. It was printed again by Johannes Buxtorf (Basel, 1567).
[263] See Griño (1971, 1979).
[264] Pinsker (1863), pp. 133–72.
[265] Lippmann (1834).
[266] See, e.g., an anonymous *Sefer ha-Diqduq* (MS Escorial G-II-5, ff. 182r–207v); see Del Valle Rodríguez (1996).
[267] He translated Baḥya Ibn Paquda's *Ḥovot ha-levavot* into Hebrew.
[268] Bacher (1888).
[269] See Téné (1971), col. 1371.
[270] Mathews (1887).

Ibn Labrāṭ and often takes issue with Rabbenu Tam. The second part is devoted to an analysis and criticism of Menaḥem ben Saruq's dictionary and methods, in the light of Qimḥi's independent research and the "new" grammatical approaches of Ḥayyūj and Ibn Janāḥ, which he follows.[271] It has been argued that the second part of the work was originally written a considerable time after the first part and may have been intended to be an independent work or rejoinder.[272] It contains the glosses of a certain Benjamin, probably Rabbenu Tam's student Benjamin of Canterbury (or rather Cambridge[273]), who defended his master against Qimḥi's criticisms. This lively polemical exchange is more than a mere discussion of grammatical concepts. Through his debate with the leading tosafist, Qimḥi attacks the "rabbis of France" (under whose influence the Provençal communities were), accusing them (quite unjustly, as we saw) of focusing on talmudic studies and neglecting grammar. He offers R. Hai and Ibn Ghayyat of al-Andalus, who were both excellent talmudists and grammarians, as models for emulation.[274] Joseph Qimḥi's aim was achieved: His works were instrumental in introducing the Spanish grammatical school of Ḥayyūj and Ibn Janāḥ into the Ashkenazi grammatical tradition.

Joseph's son Moses was born in Spain and immigrated to Narbonne with his father, who was also his teacher. He lived there until his death, circa 1190. He wrote biblical commentaries that are often based on grammatical issues,[275] and three grammar books, two of which are extant and played a major role in the study of Hebrew in later periods.[276] These are *Śekel ṭov* (Good Sense)[277] and *Sefer Darḵei lešon ha-qodeš*, better known as *Mahalaḵ ševilei ha-daʿat* (Walking the Paths of Knowledge; the title is an acrostic of the author's name, משה).[278] The latter is of particular importance as the first truly pedagogical grammar of the Hebrew language. It follows a clear structure and deals with the main grammatical issues: definition of the parts of speech; discussion of the consonants and their functions; the vowels; rules of the *dagesh*, schwa, and stress; types of nouns; and, the most prominent part, the conjugation in seven *binyanim* of regular verbs (using פקד as the model) and weak verbs, according to the *gezerot*. The bulk of the work focuses on verb morphology and contains conjugations for all forms, including those with object suffixes. Moses Qimḥi's main innovation was to present all verb forms in structured and complete paradigms.[279]

Moses Qimḥi's clear and practical presentation of the Hebrew grammar was appreciated by his contemporaries and following generations; his *Mahalaḵ ševilei ha-daʿat* was certainly one of the most popular and frequently copied grammar books. It gave rise to several anonymous abridgments and vulgarized versions, preserved in manuscripts that have not been sufficiently studied to date.[280] One example is the aforementioned Judeo-Italian translation of the verb paradigms. *Mahalaḵ ševilei ha-daʿat* became even more popular in the age of printing: It was the first grammar book (as distinct from dictionary) to appear in print (Soncino, 1488).[281]

[271] Bacher (1882b).

[272] Hirschfeld (1926), p. 81.

[273] The reading "Benjamin of Cambridge" instead of "Benjamin of Canterbury" was first proposed by Jacobs (1893, pp. 54, 281–2), who identified him with an English masorete, Berachiah ha-Naqdan's uncle, mentioned in the latter's commentary on Job.

[274] *Sefer ha-Galui*, introduction, ed. Mathews (1887), p. 2. See Cohen (2000a), pp. 391–2.

[275] See Talmage (1991), pp. כו–ל; Eldar (1997), p. 196 n. 16.

[276] A third work by Moses Qimḥi, lost today, is mentioned by David Qimḥi in his *Miḵlol* under the title *Sefer Taḥbošet*.

[277] Meyer (1926); Castelli (1894); De Ortueta y Murgoitío (1920); see Talmage (1991), p. י"ד. There is some discussion about Moses Qimḥi's authorship of this work.

[278] Editio princeps, 1488; many subsequent printed editions, the last one in Lemberg, 1867.

[279] It has been suggested by Ilan Eldar that Moses Qimḥi's model for writing paradigms came from the Latin grammatical tradition; see Eldar (1997), pp. 203–4.

[280] See Bacher (1890a).

[281] The editio princeps appeared at the Soncino press in 1488 and again in 1508 with a commentary by Elias Levita. It was printed many times during the sixteenth century alone: without Levita's commentary in Pesaro

It was published with Latin annotations in Paris in 1520[282] and was translated into Latin (together with Levita's comments) by Sebastian Münster as *Liber viarum linguae sanctae* (Basel, 1531). Münster's edition came to play a major role in the development of Hebrew studies among Christians.

However, the most influential proved to be Moses' younger brother, David ben Joseph Qimḥi (Narbonne, ca. 1160–1235), to whom later generations applied the saying (M Avot 3:21), "Without flour (Heb. *qemaḥ*) there is no Torah." Unlike his brother's book, David's grammatical works are not basic textbooks; they did, however, play a leading role in the study of Hebrew. David, who was very young when his father died, was brought up and educated by his older brother. He supported himself as a Talmud teacher and wrote a number of biblical commentaries and two grammatical works: *ʿEṭ sofer*, a short treatise on the copying of liturgical scrolls, which also contains a brief grammar,[283] and his magnum opus, *Sefer Mik̲lol* (Comprehensive Book), written circa 1205, with two parts – a grammar (which itself acquired the title *Sefer Mik̲lol*)[284] and a complete dictionary of biblical Hebrew followed by the dictionary of biblical Aramaic, *Sefer Šorašim* (Book of Roots).[285] The *Mik̲lol* as a whole was based on the ideas of Ḥayyūj and Ibn Janāḥ and followed the division into grammar and dictionary of the *Kitāb al-tanqīḥ*. That was its main source, probably in the Hebrew translation by Judah Ibn Tibbon (Lunel, 1171) rather than in the Arabic original. Born in Narbonne, David Qimḥi was probably a less proficient Arabist than his father and his brother Moses. He did make some comparisons between Hebrew and Arabic and sought to provide an Arabic etymology for some Hebrew words; nonetheless, comparisons and translations into his native Provençal are much more frequent.

The grammar part (*Sefer Mik̲lol*) is an example of a clear practical arrangement combined with a very thorough and comprehensive analysis that includes a wealth of examples, quotations, and various grammatical digressions. It opens with a section on the traditional division of the parts of speech, followed by three corresponding sections of unequal length, each subdivided into various chapters and subsections. Two-thirds of the book is devoted to the morphology of the verb. First, thirty-two categories of the regular verb are discussed in separate sections: *qal*, transitive and intransitive verbs, the role and the formation of the *binyanim* with examples of conjugation, *qal* verbs with object suffixes, and so on. Next come weak verbs by *gezerot* and the conjugation of verbs composed of four or five consonants. Throughout the section of verbs, we find discussions on related subjects, such as the theory of assimilated consonants, in the context of verbs whose first consonants are assimilated. The section on nouns deals with the morphology of the basic regular nouns, with irregularities, and with different noun patterns (*mišqalim*). It also contains discussions of vocalization. The very short final section is structured as an alphabetical list of particles, together with examples and biblical quotations illustrating their use.

David Qimḥi's dictionary, *Sefer Šorašim* (Book of Roots), follows the alphabetical arrangement of triliteral roots, just like its main model, Ibn Janāḥ's *Kitāb ʾuṣūl*. Besides Ibn Janāḥ, David Qimḥi also quotes his father, his brother, Isaac Ghayāt, a certain ʿEli ben Ha-nazir

(1509, 1517, and 1518) and in Hagenau (1519), and with Levita's commentary in Ortona (1519). In 1546 Levita published a definitive version of the *Mahalak̲* with his commentaries, together with three other grammar books, at the Bomberg press in Venice. It was subsequently printed in Venice (1552), Mantua (1563 and 1578), Cracow (1620), Lublin (1621), Venice (1624), Leiden (1631), Hamburg (1785), and Lublin (1867). See Sermoneta (1967), p. 60 nn. 3a–4.

282 It was published by A. Giustiniani and simultaneously in Augsburg (by J. Boeschenstein), and again in Paris, with three other grammars, in 1521.

283 Goldberg (1864).

284 Rittenberg (1862); see Chomsky (1952).

285 Lebrecht and Biesenthal (1847).

(whose work is not known), and Jacob ben Eleazar, the author of the *Kitāb al-Kāmil*. However, his interpretations are often different from these sources, namely in the use of comparisons with rabbinic Hebrew and Aramaic (whose dictionary is appended to *Šorašim*) and with the Provençal dialect. Indeed, David Qimḥi's work does not answer the simple need to transmit the Spanish arabophone philology to trans-Pyrenean Europe: The translation of Ibn Janāḥ's works by Judah Ibn Tibbon appeared when David was ten years old; and Solomon Ibn Parḥon's *Maḥberet he-ʿaruḵ*, which, as we saw, is a comprehensive dictionary also largely based on Ibn Janāḥ, appeared around the time of his birth. It is interesting that David Qimḥi never mentions Ibn Parḥon. It is difficult to agree with Hirschfeld that Qimḥi was simply unaware of this work because of the poor circulation of manuscripts:[286] At the time of the writing of Qimḥi's magnum opus in 1205, *Maḥberet he-ʿaruḵ* had been the most influential source of Spanish grammar in Western and northern Europe for at least a generation.

David Qimḥi's work had at first a mixed fortune among Jewish grammarians: followed by some, criticized by others (such as Joseph Kaspi and Profiat Duran), and sometimes even passed over in silence in Provence itself (for instance, by Bedersi; see later text). It was, however, the standard reference in the sixteenth century; with its printed versions and acceptance by Christian scholars as the almost exclusive model, it became the basis of the teaching of Hebrew grammar until the present. *Šorašim* was first printed in 1469–72, in Rome,[287] and the grammar *Miḵlol* in 1525, in Constantinople. David Qimḥi's grammar and dictionary became a cornerstone of Christian Hebraism and were used, translated, and followed by such authorities as Reuchlin, Sanctus Pagninus (whose *Institutiones* and *Thesaurus* are entirely based on Qimḥi), and Robert Wakefield. Sebastian Münster edited *Sefer Šorašim* as *Dictionarium hebraicum (. . .) ex radicibus David Kimhi* (Basel, 1535 and 1539). Its popularity and authority were such that until the nineteenth century, it was almost the only work on Jewish grammar studied in European universities.

David Qimḥi's authorship was also claimed for a work named for its incipit, *Petaḥ devarai* (The Opening of My Speech, after Ps. 119:130), a practical Hebrew grammar conceived, as stated in the introduction, for the needs of the author's students.[288] David Qimḥi's authorship was claimed by Levita and Abraham de Balmes in his *Miqneh ʾAvram*[289] but convincingly rejected by W. Bacher.[290] *Petaḥ devarai* (whose author's name was apparently David) is indeed by a grammarian of the Spanish tradition. It has been dated to the thirteenth century by Bacher. D. Téné suggested that its author may have been David, the son of the grammarian Judah ben Jeḥiel (Messer Leon) (see earlier text), which would place the work in the late fifteenth century,[291] but some manuscripts of *Petaḥ devarai* seem to date from the fourteenth century (for example, MS Paris, BNF, hébr. 1238). *Petaḥ devarai* quotes Ḥayyūj, Ibn Janāḥ, and Abraham Ibn Ezra. It does not mention David Qimḥi, but it is undoubtedly close to the *Miḵlol*.

The author's grandson, Meir ben Solomon ben David, wrote a supplement to *Petaḥ devarai*. This basic grammar, preserved in one manuscript,[292] devotes its seven chapters mainly to

[286] Hirschfeld (1926), p. 85.

[287] Three other editions appeared before 1500 (Naples, 1479, 1490, and 1491) and many others appeared during the sixteenth century alone.

[288] Editio princeps in Naples, 1492.

[289] Accepted by Hirschfeld (1926), p. 83. The confusion was based not only on the name of the author – David – but also on the fact that *Petaḥ devarai* was often copied together with David Qimḥi's *Sefer Miḵlol*, as in MS Paris, BNF (Heb.), 1238, 1239, 1240.

[290] Bacher (1894a).

[291] Téné (1971), col. 1389.

[292] MS Montefiore (Halberstam) 410.

verbal patterns. Meir ben Solomon stated that he included in his grammar everything that his grandfather had left unexplained.[293]

An important work of the Provençal school is *Ḥotam tok̲nit* (The Seal of the Pattern), a dictionary of Hebrew synonyms by Abraham ben Isaac Bedersi (i.e., of Béziers; ca. 1240–1300).[294] This author was a disciple of the liturgical poet Jehoseph ʾEzobi (brother of the grammarian Meshullam ʾEzobi of Béziers, to be subsequently considered, in the section on Spain) and was active in several Provençal towns (Perpignan, Narbonne, and Béziers). *Ḥotam tok̲nit* is the first comprehensive monograph on Hebrew synonyms. It focuses on nouns but includes other parts of speech as well. It is divided into twenty-two parts, one for each letter of the Hebrew alphabet, and subdivided into 360 sections (*šeʿarim*), each devoted to a group of synonyms. The nuances of meaning are related to the grammatical derivation of the forms from the root. The meanings are established not only from the context of the words in the Bible but also by comparison with the Targum and Talmud as well as with Arabic. Bedersi's approach, namely his concept of the Hebrew root, is essentially Spanish; he often quotes Ibn Janāḥ. He must have known the work of the Qimḥis. It is striking, however, that he does not mention any of them in his work. Instead, at least as far as explicit references are concerned, Bedersi seems to go back to the grammarians who were important for the development of the French Ashkenazi school: the old Spanish masters, Menaḥem ben Saruq and Dunash Ibn Labrāṭ; Solomon Ibn Parḥon, whose name is so conspicuously absent from David Qimḥi's work but whom Bedersi honors in his introductory poem; and, interestingly, Rashi and Rabbenu Tam.

By the mid-fourteenth century, some of the Provençal grammarians attempted to bring Hebrew linguistics closer to Aristotelian logic and were critical of purely practical works such as those of David Qimḥi. Joseph ben Abba Mari Kaspi (Largentière, 1297–Tarascon, 1340), a prolific philosopher and exegete and author of no fewer than twenty-nine books, wrote three works on linguistics: a commentary on Ibn Janāḥ's *Sefer ha-Riqmah*, today lost; *Šaršot kesef* (Chains of Silver);[295] and *Retuqot kesef* (Garlands of Silver). *Šaršot kesef* is a dictionary of biblical Hebrew according to triliteral roots. Kaspi's attachment to the triliteral theory of the Hebrew root was so great that he looked for such roots even for biliteral nouns. The entries first list a general meaning of the root and then various meanings of verbs and nouns derived from the main meaning through logical principles. Philosophical principles also underlie Kaspi's description of Hebrew grammar in *Retuqot kesef*.

Despite the increasing criticism of simple educational grammars, Kaspi's contemporary Solomon ben Abba Mari Yarḥi of Lunel wrote a short grammar in two parts (phonology and parts of speech) entitled *Lešon limmudim* (Language of Learning), in which he complained about the deficient knowledge of the Hebrew language.[296]

At the crossroads between linguistics and biblical studies is the work of Isaac Nathan ben Qalonymus (called Mordecai Nathan on the title page of the printed editions), a prominent merchant and scholar, and member of the Nathan family of Arles (fifteenth century).[297] Most of his works are related to anti-Christian polemics. That was also one of the motives for his magnum opus, the first Hebrew Bible concordance, *Meʾir nativ* (Illumination of the Path), written in 1437–1447.[298] In the introduction to his concordance, Isaac stated that

[293] Bacher (1885), pp. 143–4.
[294] Polak (1865).
[295] Last (1906). See Aslanov (2000, 2001).
[296] Hirschfeld (1926), App. IV (fragments).
[297] Iancu-Agou, 1987
[298] Editio princeps in Venice, 1523, later Venice, 1564, and Basel, 1556 (by Johannes Buxtorf) and 1581; see Heller (2004), Vol. 2, p. 707. For a detailed description of the *Meʾir Nativ* and its role in polemics, see Ben-Shalom, 2011 (in print).

the aim of his work was to help with biblical exegesis and to prevent erroneous quotations from the Bible in polemics with Christians and apostates. This concordance was the Hebrew counterpart of the Christian concordances of the Latin Bible, notably that by the Franciscan Arlottus of Prato, written in 1290. Isaac ben Nathan's concordance is alphabetized by Hebrew roots. Derived verbs and nouns appear under each root, with no systematic order; particles are disregarded. Most importantly, the biblical references are given by chapter and verse. The order of the biblical books corresponds to that in the Vulgate rather than to the masoretic text, probably to facilitate a rapid reference in the context of the polemical discussion with the Christians. It was the first time that the chapter divisions (introduced first into Vulgate manuscripts, probably by Stephen Langton at the end of the twelfth century) was applied to the Hebrew text, which had always been divided into *parašiyyot* (sections, pericopes). Isaac ben Nathan's chapter divisions (along with indication of the *parašiyyot*) were used in Jacob ben Ḥayyim's *Biblia rabbinica*, printed in 1524, and have become the standard in most editions of the Bible.

Spain

Although the period under consideration clearly marks the triumph of the Spanish grammatical tradition, most of the grammatical works inspired by the achievements of this school were written outside Spain: in Italy, in Provence, and increasingly in Byzantium. The persecution of the Jews in al-Andalus under the late Almoravids (1090–1145) and especially under the Almohades (1148–1232) was probably the cause of the emigration of twelfth-century scholars like Solomon Ibn Parḥon and Joseph Qimḥi, of translators like Judah Ibn Tibbon, and later, in the 1230s, of the aforementioned Granada-born physician Solomon ben Joseph ben Job, who translated the works of Ibn Janāḥ in Béziers.

It seems, however, that important Hebrew grammarians were still active in Spain in the late twelfth century and after. Such may be the case of Jacob ben Eleazar, who wrote a grammar cum lexicon known under the Arabic title of the *Kitāb al-Kāmil*. Very little is known about his life, however. Although it is certain that Jacob ben Eleazar was Spanish, it is not clear if he wrote his works in Spain or in Provence: He certainly seems to have been in touch with Samuel and Ezra, the sons of Judah of Beaucaire.[299] The *Kitāb al-Kāmil* was long considered lost,[300] but some fragments are probably extant: N. Allony attributed three fragments from three different Oriental manuscripts found in the Cairo Geniza to it.[301] The book is mentioned in medieval grammatical literature, notably by David Qimḥi and by the author of a thirteenth-century Ashkenazi grammar, *Ḥibbur ha-qonim*. The aforementioned *Kitāb al-Taysīr* (Book of Facility) by Solomon ben Mubārak contains more than seventy quotations from the *Kitāb al-Kāmil*. The comparison of these quotations with some extant anonymous manuscripts in the Firkovitch collections has led Martínez Delgado to suggest that these manuscripts contain the text of the *Kitāb al-Kāmil*.[302]

In the fourteenth and fifteenth centuries, there was scant intellectual activity in the field of Hebrew linguistics in what remained of Muslim Spain. Nor did Hebrew philology flourish in the Christian north. It has been argued, however, that there was some continuity in the tradition of Hebrew linguistics in southern Spain; for example, when the Granada rabbi and

299 Allony (1977), p. 5.
300 Bacher (1892), p. 110.
301 Allony (1977). See Del Valle Rodríguez (1998). Some fragments from another work were recently identified and attributed to the *Kitāb al-Kāmil* by José Delgado, who is preparing an edition.
302 Martínez Delgado, 2010, p. 19.

scholar Saadia Ibn Danān wrote his grammar and dictionary in the 1460s, he had access to and good knowledge of an impressive array of earlier sources.[303]

It is also important to stress that the movement of grammarians and grammatical ideas was not exclusively "out of Spain." Some Provençal authors settled in Spain and wrote their works there. This is the case of Meshullam Ezobi of Béziers (brother of the poet Jehoseph), in the late thirteenth century,[304] who wrote his commentary on the Pentateuch, *Sefer ha-ʾEzovi*, as well as a grammar called *ʾAgudat ʾezov* (Bunch of Hyssop) in Spain.[305] The still unpublished *ʾAgudat ʾezov* is preserved in two manuscripts;[306] one of them, a Geniza fragment of a fifteenth-century North African copy, may attest to a long-lived interest in this work.

Isaac ben Moses Profiat Duran ha-Levi (known as well as Maestre Profiat or Efodi), the author of a most important Hebrew philosophical grammar, the *Maʿaśeh ʾefod*, written in 1403,[307] was born of parents from Provence, either in Perpignan or in Catalonia. He apparently studied briefly in Germany, but his writing activity is mostly related to Catalonia.[308] This extensive work, in thirty-three chapters, has often been described as following to a large extent the Scholastic Latin grammatical tradition based on Aristotelian logic.[309] The influence of medieval Latin grammars (Profiat Duran lived as a Christian for a number of years, which may partly account for his knowledge of the Latin linguistic tradition) is argued from the structure of the work as well as from the space it devotes to the nature and philosophy of language and language theory as distinct from technical and pragmatic description of grammatical categories. Thus, the work opens with five chapters corresponding to the discussions of the *causae* of the language: chapter 1, on the nature of language; chapter 2, on its purpose; chapter 3, on the *causa efficiens*; chapter 4, on the three parts of speech; and chapter 5, on its elements (consonants, vowels, and accents). They are followed by a chapter on phonetics (organs of speech and the production of sounds), on the decline of Hebrew after its pristine pre-Babel condition, and on the definition of linguistic science, which includes grammar, rhetoric, and poetics. The purely grammatical part of the book begins with chapter 9. Unlike the traditional Hebrew grammars, which give priority to the verb, Profiat Duran, like Latin grammarians, begins with a definition of the noun. Chapters 10 to 23 deal with verbs, beginning with a discussion of the infinitive and describing each *binyan* in a separate section. One chapter deals with particles. An important section (chapters 31 and 32) focuses on the rules of the *beged kefet* letters and on pronunciation. The rules of pronunciation follow the traditional Spanish approach. Profiat Duran often criticized David Qimḥi. His work was in turn scrutinized critically by David ben Solomon Ibn Yaḥya (see earlier text). The fifty criticisms of David Qimḥi included in *Maʿaśeh ʾefod* and the five in David ben Solomon Ibn Yaḥya's *Lešon limmudim* were rejected by Elisha ben Abraham ben Mattathias in his *Magen David* (Shield of David).[310] Though it did not manage to undermine the Qimḥis's authority, *Maʿaśeh ʾefod* remained an important and original work and exerted some influence especially in Italy, with the work of Judah ben Jeḥiel (Messer Leon) of Mantua (see earlier text).

[303] Del Valle Rodríguez (2004), p. 29.

[304] Gross (1897), p. 104.

[305] See Del Valle Rodríguez (2003).

[306] Paris, BNF héb. 992, ff. 57v–75r, and a fragment from the Cairo Geniza copied in the fifteenth century, probably in North Africa, presently in the Schøyen Collection (No. 1866), previously MS Sassoon 532; see Sassoon (1932), Vol. 1, p. 485.

[307] Friedlander and Kohn (1865).

[308] Gronemann (1869); Gross (1897), pp. 358–9; Zwiep (1997).

[309] Recently, Zwiep (1997). The influence of speculative grammar in the *Maʿaśeh ʾefod* was rejected by Freudenthal (2001), who considers that the philosophical nature of this grammar can be based on Jewish sources.

[310] Printed in Constantinople in 1517.

One of the most important linguistic works in the classical Spanish tradition was composed on the eve of the expulsion of 1492: the grammar and dictionary of biblical Hebrew written in Granada in 1468 by the rabbi, poet, historian, and exegete Saadia ben Maimon Ibn Danān (Granada, 1430s–Oran, 1493). The grammar, first written in Arabic and entitled *al-Ḍarūrī fī al lugha al-ʿibrāniyya* (The Necessary Book of the Hebrew Language), was translated into Hebrew by Ibn Danān himself, at the request of his students who did not know Arabic (probably from northern Spain), in 1473, under the title *ha-Kelal ha-hekreḥi be-diqduq ha-lašon ha-ʿivrit*.[311] This grammar can be considered an introduction to the Hebrew-Arabic dictionary of the Bible, with the traditional title of *Kitāb al-uṣūl* (*Sefer ha-Šorašim*; Book of Roots).[312] The three works – the grammar in Arabic, its Hebrew translation, and the dictionary – are preserved in a unique manuscript, copied in 1480,[313] except for a passage on meter from the Hebrew grammar, which was copied in a later manuscript.[314] The grammar begins with the division into the three parts of speech and deals with each of them in a separate section: noun, verb, and particle. These are followed by sections on the consonants, the vowels, and prosody. The grammar is concise and reflects the classical Spanish tradition of Ḥayyuj, although Ibn Danān considers some roots to be composed of only two consonants. He often quotes Joseph Qimḥi, whom he follows in the distinction of ten vowels, and Abraham Ibn Ezra. Despite the concise and practical nature of the grammar, Ibn Danān gives some theoretical and methodological material, such as brief discussions of the conventional nature of language and the use of analogy and consensus in the elaboration of grammatical rules. The dictionary is divided into twenty-two sections, according to the letters of the alphabet. The entries follow the absolute order of all the consonants of the root. Although the majority of the entries are triliteral, some biconsonantal entries are found, as well as words composed of four or five consonants. The explanations are short: They contain contextual examples, an Arabic translation, and occasional explanations in Arabic to elucidate semantic nuances (for example, under צרח, he explains that צריחה אכתר מן צעקה, or "screaming is louder than shouting"[315]).

The symbolic end of the Jewish grammatical tradition in Spain and the beginning of Christian scholarship in Hebrew grammar is the work of Alfonso de Zamora (ca. 1474–1544), who converted to Christianity after 1492. His main works already belong to the world of the European Christian universities. As a Hebrew and Aramaic teacher at the college of Alcalá de Henares, for some fifteen years, he was one of the main editors of the first complete printed multilingual Bible, the six-volume *Complutensian Polyglot*, where Hebrew, Greek, Latin, and, for the Torah, Aramaic texts were arranged in parallel columns (printed in 1514–17).[316] He was the author of a Hebrew grammar, the *Introductiones artis grammatice hebraice*, which, being composed in Latin, is beyond the scope of this article.[317] However, like Elias Levita in Italy, Zamora was instrumental in transmitting the medieval Spanish grammatical tradition, and notably the work of David Qimḥi, to humanist Spain. A skillful scribe, he prepared several copies of Qimḥi's *Miklol*. He also made a Latin translation and a Spanish translation of the *Miklol*, both of which are preserved in autograph manuscripts.

311 Cohen (2000b); Del Valle Rodríguez (2004).
312 Jiménez Sánchez (1996).
313 MS Bodl. Or. 612 (Neubauer, 1886–1906, No. 1492). According to Beit-Arié (1994, No. 1492), this manuscript is Ibn Danān's autograph. This opinion is accepted by Del Valle Rodríguez (2004, p. 93) but rejected by Jiménez Sánchez (1996, p. 15).
314 MS Paris, BNF héb. 1232/3, copied in 1566; see Zotenberg (1866), No. 1232.
315 Jiménez Sánchez (1996), p. 287.
316 Price, Pelikan, and Hotchkiss (1996), pp. 109–10.
317 Printed in Alcalá de Henares in 1526 and again in 1536.

Portugal

Although the major grammatical works of authors native to Portugal were actually written abroad and are considered here under different headings, this country had some achievements as a center of grammatical learning on the eve of the expulsion in 1497. Moses ben Shem Ṭov Ibn Ḥabib (see earlier text), who settled in Palestine and later in Italy, was from Lisbon, where he must have acquired his grammatical education. The grammatical work of his contemporary David Ibn Yaḥya ben Solomon (ca. 1440–1524), printed in 1506 in Constantinople, was probably written before he left his native Lisbon.[318]

David Ibn Yaḥya ben Solomon was a member of a prominent family of scholars; his father, Solomon ben Yaḥya ben David, was admitted to the court of Alfonso V. David Ibn Yaḥya was a rabbi in Lisbon. However, accused of forcing Marranos to return to Judaism, he fled in 1476 to Naples, Corfu, and later to Latra and Constantinople. As indicated by the title, his *Lešon limmudim* is a basic grammar textbook. It was written for the instruction of Solomon's cousin and disciple David ben Joseph Ibn Yaḥya (1465–1543). The book had a great success and was printed several times: in Constantinople in 1506[319] and in abridgment, prepared by David ben Joseph Ibn Yaḥya, in Rome in 1540.[320]

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[318] Heller (2004), Vol. 1, p. 21.
[319] See Allen (1991), p. 348.
[320] See Heller (2004), Vol. 1, p. 21.

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PART III

SCIENTIFIC KNOWLEDGE IN CONTEXT

20

Medieval Karaism and Science

Daniel J. Lasker

Karaism[1] is the longest surviving form of sectarian Judaism, but its origins remain a mystery. Its opponents, the Rabbanites,[2] attribute its founding to the eighth-century Anan ben David, a disappointed candidate to be exilarch (head of the Babylonian captivity), whose pique and anger caused him to secede from normative Judaism. Karaites counter that their form of Judaism is the original one and that the schism between the two groups of Jews dates from the Second Temple period, when the Rabbanite concept of the Oral Torah was invented. Modern research has demonstrated that Anan was most certainly not the founder of Karaism (his followers were known as Ananites; they eventually coalesced with the group known as Karaites, who then retroactively adopted Anan as one of their *patres ecclesiae*);[3] opinion remains divided as to how much connection, if any, there is to Second Temple groups or whether Karaism is purely a medieval movement. Whatever their origins, by the tenth century the Karaites were a well-organized alternative to Rabbinic Judaism and created parallel institutions that developed their own brand of law, exegesis, linguistic studies, polemics, and historiography.

Karaite history, going back to the formative "Golden Age" in the ninth to eleventh centuries in the Land of Israel, has been marked by growing rapprochement with the dominant Rabbanites. Generally Karaites were accepted as part and parcel of the larger Jewish communities, but intermarriage between the groups was frowned on or forbidden. Although Karaites maintained their own institutions and religious practices, they turned more and more to Rabbanite texts and teachers. Only in Czarist Russia, where a Jewish identity involved major disabilities, did Karaites disassociate themselves from the rest of the Jewish community; in Islamic countries, however, there was never such a break. At the start of the twentieth century the largest communities were found in Egypt, Crimea, and Lithuania. Today Karaites, most of whom are of Egyptian origin, live mainly in Israel as a marginal Jewish group.[4]

[1] The word "Karaism" apparently is derived from the Hebrew root *q.r.ʾ*, referring to those who read (*qoreʾ*) Scripture (*miqraʾ*) literally. This name has led many to the common misconception that Karaites are strict scriptural literalists who have no concept of tradition. Although Karaites deny the authority of the Rabbinic Oral Torah as a later invention, they have their own interpretations, which are not always literal, and legal traditions.

[2] In the context of Karaism, followers of Rabbinic Judaism are known as Rabbanites.

[3] See Moshe Gil, "The Origins of the Karaites," in Meira Polliack, ed., *Karaite Judaism: A Guide to its History and Literary Sources* (Leiden: Brill, 2003), pp. 73–118.

[4] Much useful material about Karaite origins, history, and cultural accomplishments can be found in Polliack, *Karaite Judaism.*

Medieval Karaites were not interested in science per se. Like most of their Rabbanite counterparts, Karaites considered various branches of science to be at most a tool for religious purposes. What distinguished these two groups of Jews were the religious needs that science was called on to fulfill. By the Middle Ages, the Rabbanites had a set halakhah and the necessity for scientific investigation for purely ritual observance was not extensive. For instance, the last Rabbanite calendrical dispute occurred in the tenth century, and it concerned issues of calculation rather than astronomical data or observation.[5] Consequently, Rabbanite Jewish astronomers like Gersonides (1288–1344) did not need to investigate lunation or other astronomical phenomena for their halakhic consequences. Even those Jewish authorities who did refer to astronomical phenomena in the context of their calendrical discussions, such as Abraham Bar Ḥiyya (early twelfth century) and Maimonides (1138–1204), did so mainly for theoretical reasons. Likewise, the rabbis of the Talmud had already discussed at length which fish and fowl were permissible to eat, in light of the none-too-clear instructions of Leviticus and Deuteronomy, leaving little need for medieval scholars to study various animal species closely. Many other zoological and botanical issues with practical legal applications had also been worked out in the Talmud, which contains medical information and prescriptions as well. When rabbinic science was at odds with the experience of medieval Rabbanite Jews, it was sometimes necessary for them to defend the validity of the talmudic conclusions, at least for the time period in which its sages lived.

In contrast, Karaite halakhah developed in the Middle Ages independently of the Talmud. The Karaite calendar relies on actual lunar observation, so Karaite interest in astronomy did have practical implications. In fact, determining the calendar has always been a constant source of friction among the sectarians themselves; calendrical disputes have been a staple feature of the Karaite experience until the present.[6] Karaite astronomical research, therefore, was geared toward religious, not theoretical, needs. In terms of the dietary laws, Karaites had to determine for themselves which species were permissible to eat and which were prohibited. In general, then, to the extent that there was Karaite science, it was geared toward practical religious needs.

In addition to science, which was enlisted in the pursuit of Karaite ritual observance, Karaites engaged in scientific theory for theological discussions as well. Thus most early Karaites adopted atomism, like the Muslim followers of the Kalam who were their models, because this understanding of the physical world served as part of their proofs of the existence of God, and probably not because the structure of nature was of interest in and of itself. When later Karaites adopted Aristotelian hylomorphism, they were influenced by the theoretical arguments of the Aristotelians, not by experimental science. In addition to all of this, many

5 This was the controversy between Saadia Gaon and Ben-Meir. See Arnold A. Lasker and Daniel J. Lasker, "642 Parts: More Concerning the Saadia–Ben Meir Controversy," *Tarbiz* 60(1) (1990): 119–28 (in Hebrew).

6 The late Karaite chief rabbi in Israel, Ḥayyim Levy, was deposed in the early 1990s because of a calendrical controversy. Calendrical tensions apparently remain high in the Israeli Karaite community. Although their calendar is set in advance on the basis of when the new moon of each month is calculated to appear (in contrast to the Rabbanite calendar, which is determined by the *molad*, i.e., the calculated average conjunction, of Tishrei only), some Israeli Karaites, led by the former national secretary of the community, Magdi Shamuel, have tried to refine the procedure of calculating when the new moon is expected to be visible. A few years ago they issued an alternate Karaite calendar; they also now make observations of the new moon every month to validate their calculations. In addition, although leap months were originally added to the Karaite year when it was observed that the barley crop (the *ʾaviv*) in the Land of Israel had not yet ripened, this practice was generally replaced by the use of the standard Rabbanite system of seven leap years every nineteen years, according to a set pattern. In 2005 (5765, a leap year), however, a group of Karaites went back to *ʾaviv* sighting as the basis of intercalation; as a result they observed Passover a month before the rest of the Jewish world, including other Karaites. See the Web site, www.karaite-korner.org, for current information about lunar sightings and pictures of the ripening barley crop.

Karaites, like many Rabbanites, were interested in medicine.[7] In sum, as a small minority, part of the larger Jewish minority, Karaites did not have the resources, or the leisure, to contribute to theoretical understanding of the world and its contents, even if they had such a desire.

The present article offers a preliminary look at Karaite scientific pursuits, attempting to distinguish between science for the sake of ritual, science for the sake of theology, and science for its own sake. Reference will also be made to the extent to which Karaite science had an empirical basis.[8]

KARAITE PHILOSOPHY

Before we turn to an evaluation of Karaite science, a short review of Karaite philosophy would be useful. Like its Rabbanite counterpart, Karaism has by no means been static through the years. One of the issues dividing Karaites has been the extent to which one can rely on the intellect and reason to establish the truth. Some of the early Karaites seemed to be skeptical of the value of rational thought and the attempts to prove the truth of religion using techniques and assumptions imported from non-Jewish sources. Generally, however, Karaite thinkers have believed that one is religiously obligated to employ reason to prove the existence of God; thus, the pursuit of science and philosophy is an ordained part of the religion. Nonetheless, even if many Karaites did employ science and philosophy for theological purposes, they were divided as to which Islamic philosophical model to follow: Kalam or Aristotelianism.

By the tenth century, Karaite theologians, much like their Rabbanite Gaonic counterparts, were clearly influenced by Islamic Kalam. The greatest Karaite follower of the Kalam, Joseph al-Baṣīr (late tenth century), was an enthusiastic advocate of the Basran school of Kalam, specifically the works of ʿAbd al-Jabbār. He adopted atomism and based his proofs of the existence, unity, and justice of God on this view of the physical world. His students, most notably Jeshuʿa ben Judah, wrote additional treatises based on Kalam theology; eventually his works were translated from Arabic into Hebrew for use by the Karaite communities of Byzantium.

Al-Baṣīr's Kalam set the course of Karaite thought for almost 300 years. Although there was an eventual turn to Aristotelianism, this shift took much longer in the Karaite community than in the Rabbanite one. The changeover in Karaite philosophy began in the late thirteenth century; by the fifteenth century, Karaite intellectuals in Byzantium were willing to adopt the reigning science of the day, including a Maimonidean type of rationalism. Nevertheless, even after Karaism moved over to the dominant Aristotelianism, some typical Kalamic issues discussed by al-Baṣīr, such as why God commands nonbelievers, or whether animals receive compensation for suffering, continued to be debated in Karaism. In the early modern period, Karaite thought still had a residue of Kalamic concerns. Although other scientific areas do not seem to have been affected by theological issues, Karaite physics and metaphysics can be divided between the Kalamic period and the Aristotelian period. In addition, in the later,

7 The well-known accusation that Karaites did not believe in the use of medical care is fallacious; see Daniel J. Lasker, *Karaism and Jewish Studies*, Shlomo Dov Goitein Memorial Lecture (Tel Aviv: Tel Aviv University Press, 2000; in Hebrew); and subsequent text.

8 As in all attempts at syntheses of medieval Karaite sources, care must be taken not to rush to conclusions until the vast Karaite collections in the libraries of the former Soviet Union have been fully catalogued and studied. It should be remembered, too, that Karaism is not monolithic and that scientific views and interest varied greatly from community to community over the course of the centuries.

Aristotelian era of Karaite thought, more attention was paid to all branches of science for their scientific value.[9]

THE PHYSICAL WORLD

In the early, Kalamic period of Karaite philosophy, most Karaite thinkers believed that the world is composed of atoms, namely, tiny particles that occupy no place but are in a locality.[10] These atoms are indivisible, in contrast to the Aristotelian doctrine of infinitely divisible matter. The details of the Karaite atomic doctrines varied from thinker to thinker; the classical Kalamic theory of atomism, with its technical terminology, was adopted by al-Baṣīr and his student Jeshuʿa almost directly from the Basran mutakallim ʿAbd al-Jabbār. Earlier Karaites, such as the tenth-century Yefet ben Eli and Jacob al-Qirqisānī, were less explicit in their views of the basic constituent parts of the physical world, although they seem to have accepted atomic theories of one type or another.

Maimonides (*Guide* I, 71) understood the mutakallimun's adoption of atomic theory as related to their denial of natural properties; he claimed that those who held such beliefs did so because of their desire to prove the creation of the world (and, thereby, the existence of a personal, providential God). Whether or not this was the atomists' motivation (after all, as the Karaite philosopher Aaron ben Elijah [d. 1369] pointed out, Epicurus, the father of Greek atomism, did not believe in creation and personal providence),[11] it is clear that Kalamic and, in their wake, Karaite proofs of creation were based on atomic assumptions. Atoms cannot be eternal; the decision to bring them into existence at a particular point in time was divine.[12]

Later Karaites did not accept atomism in its Kalamic form. Judah Hadassi (fl. 1149) described atoms as very small particles, not as the indivisible constituent parts of nature. Aaron ben Elijah analyzed classical Karaite atomism at length, but he implicitly rejected it in favor of Aristotelian hylomorphism.[13] After Aaron, there were no serious Karaite attempts to defend atomism, even on a theoretical basis. Simḥah Isaac Lutski (1716–60), although aware of modern atomic theories, rejected them and asserted that classical Karaite atomism was an honest error, based on a mistaken understanding of kabbalah.[14]

Aaron ben Elijah explained that the experiential basis of both the Aristotelian and Kalamic views was the perception of bodies and of the accidents inherent in them. Ultimately, however, the decision in favor of the Kalamic atomic doctrine or the Aristotelian doctrine that the

[9] For a review of the development of Karaite philosophy, see Daniel J. Lasker, *From Judah Hadassi to Elijah Bashyatchi: Studies in Late Medieval Karaite Philosophy* (Leiden: Brill, 2008). Karaite attitudes toward religion and science are discussed there, on pp. 15–28.

[10] The locution is Maimonides'; see Moses Maimonides, *The Guide of the Perplexed* I, 51, trans. Shlomo Pines (Chicago: University of Chicago Press, 1963), p. 113. This seemingly nonsensical description of Kalamic atomism is intentional, because Maimonides' purpose is to ridicule the beliefs of the Kalām. The discussion that follows is based generally on Haggai Ben-Shammai, "Studies in Karaite Atomism," *Jerusalem Studies in Arabic and Islam* 6 (1985): 243–98, where full documentation is available. See also Harry A. Wolfson, *Repercussions of the Kalam in Jewish Philosophy* (Cambridge, MA: Harvard University Press, 1979), pp. 162–71.

[11] Aaron ben Elijah, *ʿEṣ ḥayyim*, ed. Franz Delitzsch and Moritz Steinschneider (Leipzig: J. A. Barth, 1841), p. 15.

[12] For a full discussion of the Karaite doctrines and their Kalamic sources, see Georges Vajda, *Al-Kitāb al-Muḥtawī de Yūsuf al-Baṣīr* (Leiden: Brill, 1985), pp. 32–64.

[13] This statement is a matter of disagreement between Haggai Ben-Shammai and me; see his "Karaite Atomism," pp. 280–5, and my *From Judah Hadassi to Elijah Bashyatchi*, pp. 73–82.

[14] See Daniel J. Lasker, "Simḥah Isaac Lutski, an Eighteenth-Century Karaite Kabbalist," in Zeev Gries et al., *Shefa Tal: Studies in Jewish Thought and Culture presented to Bracha Sack* (Beer Sheva: Ben-Gurion University of the Negev Press, 2004), pp. 171–89 (in Hebrew); for a general overview of Lutski, see Daniel J. Lasker, "The Life and Works of Simḥah Isaac Lutski: A Preliminary Intellectual Profile of an Eighteenth-Century Volhynian Karaite," in Dan D. Y. Shapira and Daniel J. Lasker, eds., *Eastern European Karaites in the Last Generations* (Jerusalem: Ben-Zvi Institute, 2011), pp. [36]–[56].

basic constituent elements of the world are matter, form, and privation was based on rational speculation and not on sense perception.[15] Thus most Karaite discussions of these issues were also theoretical. Occasionally, however, one can find references to actual physical experiences. Al-Qirqisānī, for instance, offered a proof of the nonexistence of empty space based on the fact that water can be held up by air inside an upside-down container.[16]

ASTRONOMY

Not all Karaite science was theoretical. A good example of an observational science is astronomy, which is vital for the Karaite calendar.[17] One of the main differences between the early Karaite and Rabbanite calendars was the fact that, in the former, the first day of each month was determined by observation of the lunar phases and that leap years were proclaimed if the barley (the *ʾaviv*) had not sprouted in time to be harvested for Passover. Despite the reliance on astronomical observation for determining the beginning of each month, there is no evidence that the Karaites were experts in the movements of the heavenly bodies. Early Karaites even seemed to be skeptical of the ability to comprehend the size and nature of the universe, despite the Greek estimates of the distances between the spheres, which had been incorporated into rabbinic literature.[18] Levi ben Yefet Halevi's *Sefer Miṣvot* (Book of Commandments), an early eleventh-century legal compilation, written in Judeo-Arabic and translated into Hebrew in Byzantium, has a long discussion of the importance of sighting the new moon and of the *ʾaviv*, but mostly in a polemical mode against the calculated Rabbanite calendar.[19] Similarly, the calendrical section in Aaron ben Elijah's legal compendium *Gan Eden* (Garden of Eden) is structured in the manner of Levi's work and has very little detailed astronomical information.[20]

This situation changed in the fifteenth century, when Byzantine Karaites were exposed to technical astronomical calculations as found in Ptolemy's *Almagest* and Sephardi scientific treatises, as mediated by Rabbanite teachers such as Mordecai Comtino (1402–82).[21] One of Comtino's students, and the leading Karaite of the time, was Elijah Bashyatchi (or Bashyazi, ca. 1420–90). Although Bashyatchi's legal discussion concerning the calendar included many

[15] Aaron ben Elijah made this observation. He discussed the theoretical assumptions at length in *ʿEṣ ḥayyim*, pp. 6–19. For an English translation of this discussion, see Morris Charner, "The Tree of Life by Aaron ben Elijah of Nicomedia," Ph.D. dissertation, Columbia University, 1949, pp. 10–30. Cf. Ben-Shammai, "Atomism," pp. 280–5.

[16] See Ben-Shammai, "Atomism," p. 252.

[17] Magdi Shamuel, "The Karaite Calendar: Sanctification of the New Moon by Sighting," in Polliack, *Karaite Judaism*, pp. 591–629, offers a partisan account of Karaite calendrical theory, providing a survey of mostly postmedieval literature, not all of which is accurate. Shamuel is the leading contemporary Karaite advocate of astronomical observation for calendrical purposes.

[18] See Georges Vajda, *Deux commentaires karaïtes sur l'Ecclésiaste* (Leiden: Brill, 1971), p. 131.

[19] Levi ben Yefet Halevi, *Sefer ha-Miṣvot*, ed. Joseph Algamil (Ashdod: Makhon Tiferet Yosef, 2001–2), 1: 41–144. The Hebrew version of Levi's work is not totally reliable; see Haggai Ben-Shammai, "Qetaʿ ḥadaš me-ha-maqor ha-ʿaravi šel Sefer ha-Miṣvot le-Levi ben Yefet ha-Qaraʾi" (*Sefer ha-Mitzvoth* of the Karaite Levi ben Yefet), *Šenaton ha-mišpat ha-ʿivri* 11–12 (1984–6): 99–133. Karaites agree that even if the new moon had not been seen, no month could be longer than 30 days. They reject a set length for each month (all Rabbanite months have a set length other than Marheshvan and Kislev) and the postponements that prevent certain holidays from falling on specific days.

[20] Aaron ben Elijah, *Sefer ha-Miṣvot ha-gadol Gan Eden* (Gözlow: Abraham Firkovich, 1864; repr., Israel: Karaite National Council, 1972), pp. 3a–22a. Aaron cited the opinions of Saadia Gaon, Abraham Ibn Ezra, and Maimonides concerning the calculated calendar, but he did not adopt the astronomical insights of the latter two individuals.

[21] See Jean-Christophe Attias, *Le Commentaire biblique. Mordekhai Komtino ou l'herméneutique du dialogue* (Paris: Cerf, 1991); astronomy was of particular interest to Comtino (ibid., pp. 75–9).

of the same polemical points made by his predecessors, he was the first Karaite authority to provide astronomical tables that enabled the members of his sect to know exactly when the new moon would be sighted. The great divide between the calculated Rabbanite calendar and the observed Karaite calendar was finally breached, although the two calendars continued to be based on different calculations.[22] Later generations of Karaites criticized Bashyatchi's tables, not for their attempt to replace observation with computation but because of their astronomical inaccuracy.[23] It should also be noted that Karaite interest in astronomy rarely included a commitment to astrology.

ZOOLOGY

Zoology was a Karaite "experimental" science only to the extent that it was pursued to support correct observance of the dietary laws. The Torah (Lev. 11; Deut. 14) distinguishes between ritually pure animal species and ritually impure ones in a variety of ways. Thus mammals must have split and cloven hooves and chew their cud to be permitted as food. Seafood must have fins and scales. For fowl, however, no list of characteristics to distinguish between the permitted and the prohibited is given.[24] On the basis of the various species mentioned in the Torah, Rabbinic Judaism has come up with a list of characteristics of permitted fowl, namely those that have an extra toe, a crop, and a gizzard that can be separated from the surrounding muscle. Furthermore, predators, which grab food in their claws, are prohibited.[25] By developing criteria of permissibility, the Rabbanites were able to allow a large range of fowl that are not mentioned in the Torah.

Karaism, however, has been more conservative. Anan ben David permitted only those species specifically mentioned in the Torah as permissible for sacrifices, turtledoves and pigeons, excluding, for instance, chicken.[26] He was followed by the mid-ninth-century Benjamin al-Nahawendi, the first sectarian to call the group "Karaites," and the late-ninth-century Daniel al-Qūmisī, the first major leader of the Jerusalem Karaite community. From Qūmisī's perspective, Jews would have to wait for the advent of Elijah to learn whether there were other permitted species.

As tenth-century Karaism engaged Rabbanite interpretations, the issue of the identification of permitted birds was treated at length. Instead of relying on the principle that only sacrificial fowl may be eaten, Karaites such as Jacob al-Qirqisānī, Sahl ben Maṣliaḥ, and Yefet ben Eli discussed the list of prohibited birds in Lev. 11 and Deut. 14, attempting to identify each item. Presumably, had the Karaites been successful in identifying the forbidden birds, they could have expanded the number of permitted ones; no consensus was reached, however, and these Karaite authorities stayed with the only unchallenged fowl, namely pigeons and turtledoves. It should be noted that their attempts at identifying permissible species were based more on etymology and comparative linguistics than on ornithology.

[22] As will be subsequently noted, Bashyatchi's brother-in-law Caleb Afendopolo wrote the first Karaite astronomical treatise, *Mikhlol yofi*, which describes the movements of the heavenly bodies but has little calendrical information.

[23] The Odessa edition of *Adderet Eliyyahu* (repr. Israel: Karaite National Council, 1966, with slightly different pagination after f. 25b) includes the corrections of the late eighteenth-century Isaac ben Solomon Lutski (not to be confused with Simḥah Isaac Lutski), author of *Sefer Or ha-levanah*; the entire section on the calendar is in *Adderet Eliyyahu*, Israeli edition, pp. 1–79.

[24] The discussion of early Karaite classifications of birds is based mostly on Daniel Frank, *Search Scripture Well: Karaite Exegetes and the Origins of the Jewish Bible Commentary in the Islamic East* (Leiden: Brill, 2004), pp. 39–61.

[25] M Ḥullin 3:6. Whether a fowl needs only one of the signs of permissibility, or all three, is a matter of dispute; see Maimonides' comment ad loc. and *Mishneh Torah*, Ma'akhalot 'asurot 1:19.

[26] See Anan's statement in his *Sefer ha-Miṣvot*, in Abraham Harkavy, ed., *Zikhron la-ri'šonim* 8 (St. Petersburg: Druck von I. Lurje Co., 1903; repr. Jerusalem: Makor, 1969), pp. 67–8; see also Solomon Schechter, *Documents of Jewish Sectarians* (Cambridge: Cambridge University Press, 1910), 2: 24.

As noted, Karaism has been marked over the centuries by a rapprochement with Rabbanism; the question of permitted fowl is another example of that phenomenon. Thus despite the efforts of the early Karaites to bar the consumption of various species and their rejection of the Rabbanite identification of the signs of permitted birds, later Karaites generally allowed the eating of those species permitted by the Rabbanites, namely (according to *Sefer Gan Eden*) quail, partridge, swan, chicken, and duck. Instead of adopting the Rabbanite classification, however, Karaites claimed that these species were known through tradition.[27]

Unlike fowl, the definition of permitted seafood – namely those fish with fins and scales – is clear. It was not, however, always clear which fish fulfilled those requirements. Because the biblical text (Lev. 11:9 and Deut. 14:9) states that the fish must have fins and scales "in seas and in rivers," Rabbanites and Karaites agreed that even if the scales fall off when the fish is taken out of the water the fish may be eaten.[28] Even here, though, matters are not so simple. Elijah Bashyatchi recorded an incident that occurred in his city of residence, Constantinople, where there were many kinds of fish whose scales fell off when they were removed from the water. Some of his fellow Karaites wished to permit a large, round fish called *tchaiki* because the Rabbanites permitted it, on the assumption that it has scales while in the water. One day, Bashyatchi and a group of prominent Karaites went down to the swamps to investigate the matter. Over 100 *tchaiki* were captured, but not one had scales, either in the water or out. A curious Greek fisherman, discovering that they were looking for scales, testified that this fish never has scales. That was enough for Bashyatchi, who returned home, but some of his co-religionists stayed behind to check more fish. This fishing expedition, with is unsuccessful results, became so well known that even some of the Rabbanites of Constantinople decided to stop eating *tchaiki*.[29]

[27] The earliest Karaite source that I have found that unambiguously permits other birds is from the fourteenth century (Aaron ben Elijah, *Gan Eden*, p. 82d). In the eleventh and twelfth centuries some Karaites were eating the controversial fowl without the approval of their leadership; see Levi ben Yefet, *Sefer ha-Miṣvot*, 3: 629–35; Judah Hadassi, *Sefer Eškol ha-kofer* (Gözlow: Mordecai Trishkan, 1836; repr. Farnborough: Gregg, 1971), f. 89c. Judah Halevi (d. 1141) questioned the basis upon which Karaites permitted chicken, goose, duck, and partridge, indicating that in twelfth-century Spain, at least, these species were eaten by Karaites; see *Kuzari* 3:35 (*Kitâb al-Radd wa-'l-Dalīl fī 'l-Dīn al-Dhalīl [Al-Kitāb al-Khazarī]*, ed. David H. Baneth and Haggai Ben-Shammai [Jerusalem: Magnes, 1977], p. 118). Aaron ben Joseph (the Elder, fl. 1294) wrote that it is better to be strict and not to adopt Rabbanite modes of identification of permissible fowl; see *Sefer ha-Mivḥar* (Gözlow [n.s.], 1835), Leviticus, pp. 16a–b. Elijah Bashyatchi (*Adderet Eliyyahu*, p. 208) followed Aaron ben Elijah and permitted the additional species. See also Daniel Frank, "May Karaites Eat Chicken? Indeterminacy in Sectarian Halakhic Exegesis," in Natalie B. Dohrmann and David Stern, eds., *Jewish Biblical Interpretation and Cultural Exchange: Comparative Exegesis in Context* (Philadelphia: University of Pennsylvania Press, 2008), pp. 124–38, 277–86 (notes).

[28] For the Rabbanite practice and a discussion of some specific species of fish, see B Avodah Zarah 39a, Ḥullin 66a–b; *Shulḥan Arukh*, Yoreh Deʿah 83:1.

[29] *Adderet Eliyyahu*, p. 229. Another account of apparently the same fishing expedition was recorded by Bashyatchi's younger contemporary, Judah Gibbor; see Abraham Danon, "The Karaites in European Turkey," *Jewish Quarterly Review* n.s. 15 (1924–5): 285–360, on p. 314. For the original text of the document, see Abraham Danon, "Documents Relating to the History of the Karaites in European Turkey," *Jewish Quarterly Review* n.s. 17 (1926–7), pp. 165–98, 239–322 (on pp. 179–81). Danon identifies the fish in question as the brill, an identification seconded by Dan Shapira in a private communication. Daniel Frank, also in a private communication, believes that the turbot is a more likely candidate, because the brill's scales are clearly visible, whereas the turbot has nail-like protuberances that are not actually scales. The brill belongs to the turbot family; Prof. Frank has informed me that the Turkish name for brill is "nail-less turbot." I would like to thank Prof. Frank for this information and for his comments on this paper. In the Arabic-speaking world, Karaites discussed the permissibility of a fish called "kenaʿat" (apparently the seerfish, or *Cybium commersonii*), which loses its scales outside the water. It is permitted by the early eleventh-century Levi ben Yefet Halevi (see his *Sefer ha-Miṣvot*, 3: 621) and by the fifteenth-century Egyptian Karaite Samuel al-Maghrebi in his halakhic compendium *Al-Murshid* (The Guide); see M. Lorge, ed., *Die Speisegesetze der Karäer von Samuel el-Maǵrebi* (Berlin: Louis Lamm, 1907), pp. 2–3 (in Arabic), p. 31 (in German). See also the eighteenth-century Hebrew translation of *Al-Murshid*, in Samuel ben Moses ha-Rofe

One can also detect some fanciful Karaite biology in the works of Judah Hadassi. Along with Kalamic proofs that the world is created, Hadassi pointed out that a number of fabulous phenomena must indicate a Creator. These include known natural phenomena, such as the manner in which water freezes; the formation of hail; earthquakes; the protective nature of the womb; worms and caterpillars that die in the winter but whose offspring return to life in the summer; the ostrich, which was thought to be part bird and part animal; animals such as hippopotamuses, monkeys, parrots, and giraffes; and so on. Less attested wonders include the barnacle geese, which grow on trees; mermen and mermaids; a tree whose fruit turns into insects and fleas; and the salamander, whose skin is not affected by fire. Two species from the plant world are particularly impressive: the *waq-waq* tree, which cries out "waq-waq" when one tries to take its fruit, and the mandrake. The latter plant has great medicinal properties inherent in its human-like roots, but harvesting it is very dangerous, because the uprooted plant makes a noise that can be fatal. Hadassi recorded that the preferred method of pulling out the mandrake was to use a rope, tying one end around the plant and the other around a dog's testicles. After moving sufficiently far away, the dog's owner calls out to the dog, which, responding to the summons, uproots the plant. Hadassi wrote of these amazing phenomena that "some of them we see with our own eyes, and some of them other people see in other places, where our eyes cannot reach, but our ears can hear."[30]

MEDICINE

A common feature of Rabbanite discussions of Judaism and medicine is the statement that Karaites eschewed medical treatment in favor of prayer and reliance on divine intervention. This assertion is based on a so-called literal reading of Exod. 15:26, which concludes with the words "I am the Lord Who heals you." This may have been the reading of Anan ben David, as reported by Jacob al-Qirqisānī,[31] but it is certainly not the view of the majority of Karaites, many of whom bore the cognomen *Harofe*ʾ (the physician).[32] Al-Qirqisānī himself incorporated much medical information in his major halakhic work, *The Book of Lights and*

ha-Maʿaravi, *Sefer ha-Miṣvot*, ed. Yosef Algamil (Ashdod: Makhon Tiferet Yosef, 2001–2), 2: 482. The question as to which species of fish do, indeed, have scales in the water seems to be a common issue; to this day even Rabbanite Jews disagree about the permissibility of certain fish. An interesting parallel to Bashyatchi's account can be found in Ḥayyim ben Israel Benveniste, *Ha-Keneset ha-gedolah*, Yoreh Deʿah 5 (Jerusalem: Makhon ha-ketav, 5757), pp. 306–7 (glosses on Beit Yosef, Y.D. 83:74); idem, *Sefer Baʿyei ḥayyei* (Jerusalem, 5730), p. 73a, concerning the swordfish. Benveniste, a sixteenth-century Constantinople Rabbanite, recorded that his grandfather, Moses Benveniste, a contemporary of Bashyatchi, placed a cloth in the net used for catching swordfish to demonstrate to a skeptical non-Jewish noble that the scales come off when the fish is caught. This account is repeated in the popular *Yalkut Me-ʿam loʿez*, Lev. 11:9–12. Rabbanite Jews generally allowed swordfish until a negative ruling was issued in the 1950s as a result of the activities of Rabbi Moshe Tendler. I would like to thank Ari Zivotofsky for sharing his halakhic and biological knowledge of fish identification with me.

[30] See Judah Hadassi, *Eškol ha-kofer*, ff. 23c–d, 149d–152d. Other sources, according to Hadassi, are the prophets and *Sefer Yosipon*; a similar description of mandrake harvesting can be found in Josephus, *Wars of the Jews* 7.6.3. Alexander Scheiber ("Eléments fabuleux dans l'*Eshkôl Hakôfer* de Juda Hadasi," *Revue des études juives* 108 [1948]: 41–62) identified the sources of many of the phenomena mentioned by Hadassi in *Sefer Yosipon* as well as in the *Book of Eldad the Danite*. On Hadassi, see Lasker, *From Judah Hadassi to Elijah Bashyatchi*, pp. 41–59; H. J. Zimmels, "ʿOfot ha-gedelim be-ʾilan," *Minḥat bikkurim* (Rabbi Aryeh Schwartz Jubilee Volume; Vienna: Menorah, 5686), pp. 1–9.

[31] Al-Qirqisānī's critique of this view is found in his *Kitāb al-Anwār wal-Marāqib* VI:12, ed. Leon Nemoy (New York: Alexander Kohut Memorial Foundation, 1939–43), 3: 593–7. Nemoy provided Hebrew and English translations in "Al-Qirqisani's Criticism of Anan's Prohibition of the Practice of Medicine," *Harofé Haivri* (*The Hebrew Medical Journal*) 11(2) (1938): 73–83 (in Hebrew); 198–207 (in English).

[32] See Lasker, "Karaism and Jewish Studies," pp. 21–5, for evidence that Anan himself may not have eschewed all types of healing, such as the use of medicaments.

Watchtowers, including discussions of gynecological and embryological issues,[33] the physiology of sleep and dreams,[34] and the sense of smell.[35]

Later Karaites also seemed to have kept up with medical discussions. Thus, Aaron ben Joseph, himself a doctor, cites "the physicians" concerning the identification of the hyssop, as well as the reason why the payment of the half shekel is applicable only from the age of twenty years.[36] Samuel ha-Maghrebi the Physician included matters of a scientific or medical nature in his halakhic code *Al-Murshid*.[37]

A KARAITE CURRICULUM

As noted earlier, by the late fifteenth century Byzantine Karaite thought was firmly in the Maimonidean–Aristotelian camp. The first major and unabashed Karaite follower of Maimonides was Elijah Bashyatchi, whose family was also instrumental in initiating Karaite religious reform, allowing the use of lamps on the Sabbath if they were lit before the start of the Sabbath (but without a blessing, as in Rabbanite practice).[38] His major literary composition, *Adderet Eliyyahu* (The Cloak of Elijah; see 2 Kings 2:13), is a legal code with a large philosophical component, reminiscent to a great extent of Maimonides' *Mishneh Torah*. Like Maimonides, Bashyatchi offered explanations of the commandments, indicating their rational nature. He also listed the principles of Judaism, even though his ten principles are not exactly congruent with Maimonides' thirteen principles.[39] The sixth principle is the obligation to understand the text of the Bible, an injunction that can be fulfilled only by acquiring scientific knowledge. To that end, Bashyatchi suggested a curriculum, which can serve as an outline of the major scientific areas of study among Byzantine Karaites in the late fifteenth century.

According to Bashyatchi, one should begin with the text of the Bible and codes of law; obviously religious observance could not wait until one was a scientific adept. Then the student was to move on to logic, studying Aristotle's *Organon*, beginning with Porphyry's *Isagoge*, and then the *Categories*, *On Interpretation*, *Prior Analytics*, *Posterior Analytics*, and *Sophistical Refutations* (one could safely leave out the *Topics*, *Rhetoric*, and *Poetics*, because they were no longer necessary for scientific investigation). Next he should continue with theoretical mathematics (the *Arithmetic* of Nicomachus of Gerasa); practical mathematics (Abraham Ibn Ezra's *Sefer ha-Mispar*); musicology; Euclidean geometry; optics; *Sphaerica* by Menelaus; the *Almagest* of Ptolemy or the *Restoration of Astronomy* (referred to by Bashyatchi also as the *Almagest*) of Jābir Ibn Aflaḥ of Seville for astronomy; studies on the astrolabe; astrology; and the natural world, including the *Physics*, *On the Heavens*, *On Generation and Corruption*, *Meteorology*, *On Plants*, *On*

33 Leon Nemoy, "Contributions to Gynaecology and Embryology (from the *Kitab al-Anwar* of al-Qirqisani)," *Harofé Haivri* 12(2) (1939): 35–41 (in Hebrew); 167–73 (in English).

34 Idem, "Al-Qirqisani's Essay on the Psycho-physiology of Sleep and Dreams," *Harofé Haivri* 22(2) (1949): 88–95 (in Hebrew); 158–65 (in English).

35 Idem, "From the 'Kitāb al-Anwār' of Ya'qūb al-Qirqisāni," *Medical Leaves* 4 (1942): 96–102. For other references to al-Qirqisāni's medical comments, see the index to Nemoy's edition of *al-Anwār*, Vol. 5, pp. 068–069. The index can also be helpful in finding additional references to scientific material in al-Qirqisāni's workbook, although many of the passages cited do not show great scientific knowledge.

36 *Sefer ha-Mivḥar*, Exodus, pp. 18a, 61b.

37 See Leon Nemoy, "Samuel ben Moses al-Maghribi," *Harofé Haivri* 25(1) (1952): 121–4 (in Hebrew); 150–3 (in English).

38 For a review of the development of Byzantine Karaite philosophy, see Daniel J. Lasker, "Byzantine Karaite Thought," in Polliack, *Karaite Judaism*, pp. 505–28. Bashyatchi's halakhic innovations are discussed by Zvi Ankori, "Beit Bashyazi ve-taqanotav," an introduction to the Israeli reprint of the 1870 Odessa edition of *Adderet Eliyyahu*.

39 See Lasker, *From Judah Hadassi to Elijah Bashyatchi*, pp. 96–122.

the Generation of Animals, *On the Soul*, *On Sense and Sensibilia*, and *On Sleep and Waking*. At this point, one can proceed to Aristotle's *Metaphysics*, and finally to the philosophical work *ʿEṣ ḥayyim* (The Tree of Life) by the Karaite Aaron ben Elijah. If this extended curriculum is too time consuming, Bashyatchi suggested that, after the works on logic, one need read only *The Intentions of the Philosophers* by Abū Ḥāmid Al-Ghazālī (d. 1111) and Aaron's *ʿEṣ ḥayyim*.[40]

Bashyatchi's proposed curriculum, which he most likely received from his Rabbanite teacher Mordecai Comtino,[41] was taken up in earnest by his brother-in-law, Caleb Afendopolo (late fifteenth century), another of Comtino's students, who was perhaps the Karaite with the greatest scientific knowledge.[42] Caleb copied Ibn Aflaḥ's *Restoration of Astronomy* for personal use and wrote a commentary on Nicomachus's *Arithmetic* (his intended commentaries of Ptolemy's *Almagest* and Euclid's *Geometry* were apparently never completed). This commentary includes a discussion of all the fields of scientific knowledge then known, with an extensive list of books in each subject area, which goes far beyond Bashyatchi's curriculum.[43] Caleb also wrote a book on astronomy, *Mik̲lol yofi* (Perfect Beauty; see Ps. 50:2),[44] and a guide to making a sundial and other instruments for measuring time, based on Comtino's work.[45] He exhibited expertise in botany as well, including a multilingual glossary (Hebrew, Arabic, a Romance language, and Greek) of the names of fruits and vegetables in his additions to Bashyatchi's *Adderet Eliyyahu*.[46] Afendopolo also had an extensive philosophical-scientific library.[47] There is no indication, however, that he engaged in any original scientific research.

From Bashyatchi's list of books and from Afendopolo's literary output we see that Byzantine Karaite intellectuals at the end of the fifteenth century were firmly rooted in the Greco-Islamic philosophical and scientific tradition.[48] They recognized all the branches of learning – logic, mathematics, physics, astronomy, and so on. Only medicine seems to be missing

[40] *Adderet Eliyyahu*, p. 168; see the discussion of this curriculum in Barry Walfish, "Karaite Education in the Middle Ages," *Dor le-Dor* 5 (1992): 1–25 (English section), on pp. 11–13. Although Bashyatchi claimed that one needed a firm scientific foundation to understand the Torah fully, he prohibited studying practical sciences, such as astronomy, arithmetic, and music, as well as medicine or antireligious philosophy, on the Sabbath; see *Adderet Eliyyahu*, p. 96. It is of interest that despite Maimonides' influence on him, Bashyatchi does not advocate reading any of Maimonides' works, even his *Treatise of Logic*. Although Bashyatchi claimed that Maimonides was a secret Karaite sympathizer, and though he obviously adopted Maimonidean views, he was not yet ready to embrace him fully. See Daniel J. Lasker, "Maimonides and the Karaites: From Critic to Cultural Hero," in Carlos del Valle Rodriguez et al., eds., *Maimónides y su época* (Madrid: Sociedad Estatal de Conmemoraciones Culturales, 2007), pp. 311–25. There may have been a Karaite commentary by Avraham Bali (early sixteenth century) on the mathematical or logical part of Al-Ghazālī's *Intentions of the Philosophers*; see Jonas Gurland, *Neue Denkmäler der jüdischen Literatur in St. Petersburg* 3 (St. Petersburg: Kaiserl. Akademie der Wissenschaften, 1866), pp. 35–6; Simḥah Isaac Lutski, *Sefer Oraḥ ṣaddiqim*, in Nisan ben Mordecai, *Dod Mordecai*, ed. Joseph Algamil and Ḥayyim Levi (Israel: Haṣlaḥah livnei miqra', 1966), p. 112; Simḥah Isaac Lutski, *Meʾirat ʿeinayyim*, ed. Joseph Algamil (Ashdod: Makhon Tiferet Yosef, 2001–2), 2: 130 (cited in Jacob Mann, *Texts and Studies in Jewish History and Literature* [Philadelphia: Jewish Publication Society, 1931], 2: 1420).

[41] See Attias, *Komtino*, pp. 73–4.

[42] A study of Afendopolo is a major desideratum; in the meanwhile, on his writings, especially the scientific ones, see Moritz Steinschneider, "Miscellen," *Monatsschrift für Geschichte und Wissenschaft des Judenthums* 28 (1894): 76–7; 30 (1896): 90–4; Danon, "The Karaites in European Turkey," pp. 315–18.

[43] The commentary survives in a unique manuscript, Berlin MS Orient. Quart. 760 (IMHM F. 1742). A short description of Caleb's account of the sciences, ff. 30b–60b, can be found in Steinschneider, "Miscellen."

[44] Caleb Afendopolo, *Mik̲lol yofi*, ed. Joseph Algamil (Ashdod: Makhon Tiferet Yosef, 2001–2).

[45] Idem, *Rovaʿ keli ha-šaʿot*, which survives in a number of manuscripts.

[46] Bashyatchi, *Adderet Eliyyahu*, pp. 393–7.

[47] The catalogue of the Institute for Microfilmed Hebrew Manuscripts lists 17 manuscripts that were once owned by Afendopolo, including works by Averroes, Al-Ghazālī, Moses Narboni, Isaac Ibn Latif, Gersonides, Profiat Duran, and others.

[48] On Byzantine Jewish philosophical attitudes in the fourteenth and fifteenth centuries, see Dov Schwartz, *Studies in Astral Magic in Medieval Jewish Thought* (Leiden: Brill, 2005), pp. 179–227.

from Bashyatchi's suggested curriculum.[49] Fifteenth-century Byzantine Karaites, therefore, believed that knowledge of science was important for Karaite Jews to be able to fulfill their religious obligations. Nonetheless, there is no indication that these Karaites were actually scientists, even though Bashyatchi's astronomical tables were innovative in the Karaite world and Afendopolo was quite conversant with scientific literature.

INTO THE MODERN ERA

Karaites in the early modern period generally held fast to the scientific views of their medieval predecessors. The best example is Simḥah Isaac Lutski, who was the outstanding Eastern European Karaite intellectual of the eighteenth century. Lutski's literary output is dedicated to the whole gamut of Karaite knowledge: halakhah, calendar, philosophy, exegesis, and even kabbalah. Though aware of modern developments in science, such as the heliocentric world and atomism, he rejected them as speculative. His major composition, which proves the creation of the world and the existence, incorporeality, and unity of God, *Arbaʿ yesodot*, assumes medieval astronomy and physics (as well as metaphysics).[50]

SUMMARY

This short review of Karaite science shows that medieval Karaites were not at the forefront of scientific discovery or even exposition. We have no Karaite scientific encyclopedias, no Karaite medical treatises, no Karaite scientific discoveries, and no Karaite astronomical observations. Those Karaites who engaged in science did so mainly for religious purposes and were not particularly original in their findings. Even a Karaite such as Caleb Afendopolo, who was quite familiar with the scientific literature, was not an independent investigator. It would seem, then, that although Karaism plays an important role in the history of Judaism, the same cannot be said for its role in the history of Jewish science.

49 See Leon Nemoy, "Medical Material in the Code of Karaite Law of Elijah Bashyatchi," *Harofé Haivri* 24:1 (1951), 108–17 (Hebrew); 156–67 (English). What Nemoy identifies as "medical material" does not indicate great medical knowledge on the part of Bashyatchi, and most of his prescriptions are derivative from other works (such as Maimonides' "Hilkhot Deʿot" [Laws of Ethical Traits]).

50 On Lutski, see Lasker, "An Eighteenth-Century Karaite Kabbalist"; idem, "A Preliminary Intellectual Profile."

21

Science in the Jewish Communities of the Byzantine Cultural Orbit

New Perspectives

Y. Tzvi Langermann

Enormous problems of a very basic sort confront the historian who would write a chapter on science in the Byzantine Jewish communities. What temporal and geographical bounds define Byzantium? Even the most preliminary investigation – and the present study claims to be no more than a very initial probing – reveals that the conventional boundaries employed in political history, for example, are not applicable. The Near East, from Syria to Egypt, was Byzantine until the Muslim conquests of the eighth century. Some seminal texts of medieval Hebrew science were (with varying degrees of probability) produced in those regions while they were under Byzantine rule, and the Greek language was widely known, even if it was not the everyday speech of Jews: These texts include *Pirqei de-Rabbi Eliezer*, *Baraitha di-Mazzalot*, *Sefer ʾAsaf*, and perhaps even *Sefer Yeṣirah*. Yet none of these texts can be considered to belong to the corpus of writings that compose, if I may call it such, "classical" Byzantine-Jewish science – by which I mean the activity of Mordechai Komatiano and other persons who flourished in the fourteenth and fifteenth centuries.[1] Those figures are every bit as remote from those early texts as were their contemporary co-religionists in the Iberian peninsula or southern France. On the other hand, there seems to be no good reason to stop talking about Byzantine science after 1453. The work of people such as R. Elijah Mizraḥi, even if carried out after Constantinople had been under Ottoman rule for some time, appears to all intents and purposes to be a continuation of the Byzantine tradition.

For the purposes of this chapter, I fix the lower bound at some time in the eighth century, when the Muslim conquests deprived Constantinople of most of its territories in the Near East, putting an end to the "Roman" rule of the entire eastern Mediterranean basin. (This definition thus conforms to the famous Pirenne thesis, which is based mainly on economic considerations.) The upper bound should lie somewhere in the sixteenth century. As I have just averred, the decisive event is not the fall of Constantinople in 1453; Byzantine science as practiced in the Jewish communities continued and even flourished under the Ottoman rulers. Instead, it seems to me that the real end came about with the inundation by Sephardi refugees, who brought with them their own and very different language, traditions, and intellectual agenda and overwhelmed the indigenous Jewish communities. In other words, Byzantine Hebrew (Romaniote) culture fell victim to the same circumstances that effectively

[1] Here I follow the spelling used by Steven Bowman, *The Jews of Byzantium 1204–1453* (Tuscaloosa: University of Alabama Press, 1985); see especially p. 149 n. 68. The correct spelling marks him clearly as of Greek (Romaniote) origin, and not Italian, as one would surmise from Comtino (and variants), which is the form still most frequently encountered.

put an end to Judeo-Arabic culture in other Ottoman domains. Sephardim, physicians in particular, enjoyed the patronage of the Ottoman rulers. Only in the mid-sixteenth century were the new realities – an Ottoman agenda and Sephardi refugees available to help implement it – fully in place.[2]

Some of the players who were active within these boundaries are well known. In some cases, such as Shabbetai Donnolo, their writings have long been available in print and a considerable body of scholarly literature has accumulated.[3] In the case of others, such as Mordechai Komatiano, far less has been published.[4] Nonetheless, we have a good idea of the range and extent of his literary activity, first from the seminal studies by Moritz Steinschneider, and later through the systematic labors of the staff of the Institute of Microfilmed Hebrew Manuscripts.[5] For the most part his writings remain unstudied; if they ever are closely studied, surely our picture of Byzantine Jewish culture will benefit. However, the proper evaluation of his legacy is a project in its own right, and as such, it lies far beyond the purview of the present undertaking.

The very important Jewish center in Candia has also received attention, mostly in the form of studies focused on certain individuals; a comprehensive monograph dealing with the whole gamut of thinkers who spent all or part of their lives there, and with the connections with Italy and points beyond as well as with Byzantium and the East, is a major desideratum. Here, as just about everywhere else, Steinschneider put research on a good footing. The brief mention in this paragraph and the bibliography in the notes suffice for the present endeavor.

In this chapter, I do not cull from bibliographic and other published secondary sources all the available information concerning the sciences in the Byzantine communities and the people who engaged in them.[6] Instead I offer here a set of perspectives that seem to be completely new and that call attention, by means of short but meaty (I hope) accounts, to personalities, texts, and events that are unknown or nearly so but that ought to be included in any comprehensive study of the sciences in the Byzantine communities. I also make brief

[2] Cf. Bowman, *The Jews of Byzantium,* pp. 129–30 and 155, concerning the fixing of the previously fluid Romaniote rite in the sixteenth century because of pressures from the Sephardi community, by then dominant.

[3] One should single out the book-length study by Andrew Sharf, *The Universe of Shabbetai Donnolo* (New York: Ktav, 1976), and the much more recent collection of studies edited by Giancarlo Lacerenza, *Šabbetay Donnolo; scienza e cultura ebraica nell' Italia del secolo* X (Naples: Università degli Studi Napoli "l'Orientale," 2004).

[4] The most useful study was published more than seventy years ago: Pincus Schub, "A Mathematical Text by Mordecai Comtino (Constantinople, XV Century)," *Isis* 17 (1932): 54–70. Jean-Christophe Attias has published a book and a number of articles recently, but these leave much to be desired, certainly as far as Komatiano's scientific activities are concerned.

[5] Steinschneider's short (perhaps unfinished) but rich article "Candia: Cenni di storia letteraria," published in installments in Mose, *Antologia Israelitica* 2–6 (Corfu, 1879–83), is by now a classic; an incomplete but revised and enlarged German version was published in *Jüdische Centralblatt* (1884): 1–24. See also Joshua Starr, "Jewish Life in Crete under the Rule of Venice," in Robert Chazan, ed., *Medieval Jewish Life: Studies from the Proceedings of the American Academy for Jewish Research* (New York: Ktav, 1976), pp. 233–88.

[6] Although there are studies on individual figures, such as those mentioned in the preceding notes, there is precious little on the community as a whole; I know only of Dov Schwartz, "Conceptions of Astral Magic within Jewish Rationalism in the Byzantine Empire," *Aleph* 3 (2003): 165–211. Joshua Starr, *The Jews in the Byzantine Empire, 641–1204* (Athens: Verlag der "Byzantinisch-Neugriechischen Jahrbücher," 1939), has a good (for the time) chapter on "Intellectual Life and Literary Products"; Starr judges the Byzantine communities' overall achievement in these areas to be mediocre. The paragraphs devoted to science focus for the most part on Donnolo, as one would expect. Bowman's book has no section on science and only some scattered references to Jews who worked on the calendar or copied astronomical manuscripts. Nicholas de Lange, "Jewish Education in the Byzantine Empire in the 12th Century," in Glenda Abramson and Tudor Parfitt, eds., *Jewish Education and Learning; Published in Honour of Dr. David Patterson* (Chur, Switzerland: Harwood Academic Publishers, 1994), pp. 115–28, has nothing to say about science; the appended list of scholars has no scientists and only a few physicians. For the important Karaite community, see Daniel J. Lasker, "Nature and Science in Aron b. Elijah," *Daʿat* 17 (1986): 33–42 (Heb.).

forays into areas or aspects of Byzantine science that have yet to be brought into the historical narrative at all: manuscript sources that have not been described and sundry other episodes that, even if discussed in some secondary literature, have yet to be impressed on the academic consciousness (I think such a thing exists) as part of the story of Byzantine-Jewish science.

SOUTHERN ITALY AND SICILY

I have already stressed that scientific activity carried out within the political boundaries of the Byzantine state at any given epoch of its history is not necessarily coterminous with what we may call Byzantine science. The most important case in point here is southern Italy and Sicily. Until the tenth or eleventh century, much of this region was under Byzantine rule, and knowledge of Greek was widespread. Shabbetai Donnolo, who flourished in Apulia in the mid-tenth century, will certainly receive a chapter in any review of Byzantine-Jewish science. Yet in keeping with the aim of this chapter, I do not review Donnolo's oeuvre here or the studies that have appeared on them. However, the wider context of Donnolo's achievement is a pressing question that I would like to raise. Specifically, we would like to know if he is *sui generis*. Was he the only south Italian Jew of his epoch who had such a strong interest in medicine and cosmology? Was he the only one to decide to write down his ideas? Or was he the only one who, for whatever reasons, had the fortune of having his legacy survive?[7]

What we can say for sure is that Donnolo is the only south Italian Jew of his period whose writings have survived. However, we do have two strong indications that the Jewish communities of southern Italy at that time were home to intense and high-level intellectual activity. The first and most solid indication is found in the reports concerning the yeshivot in Bari and other cities. The second is the evidence, still far from certain but growing and suggestive, that southern Italy was a center for translations of Judeo-Arabic writings into Hebrew, the first phase of which was certainly the most significant cultural and intellectual transmission between Jewish communities in the medieval period.[8] In this pre-Tibbonian phase some key texts, especially by Saadia Gaon, were made available to Jewish communities in Italy and then passed on to the Jews in Germany and perhaps Provence as well. Among the possibilities are the early Hebrew recension of the *Book of Beliefs and Opinions*, which R. Kiener has tentatively located in southern Italy, and the anonymous translation of Saadia's commentary on *Sefer Yeṣirah,* which I am currently studying.[9]

Though the evidence is slight, the indications are there that this was no small sideshow to Jewish intellectual history but rather a key moment, most of whose traces have unfortunately been effaced. Jacob Sussmann, a very careful and circumspect scholar, was led to southern Italy by his researches into the Jerusalem Talmud, in particular an important early text known

7 Some important observations of relevance to this question can be found in Andrew Sharf, "Shabbetai Donnolo as a Byzantine Jewish Figure," *Bulletin of the Institute of Jewish Studies* 3 (1975): 1–18 [repr. in idem, *Jews and Other Minorities in Byzantium* (Ramat Gan: Bar-Ilan University, 1995), pp. 160–77].

8 The activities of Abraham Ibn Ezra, carried out for the most part in Italy and roughly at the same time (certainly before those of the Ibn Tibbon family), are certainly part of the picture; however, there does not seem to be any connection between Ibn Ezra and the south Italian translators. Compare in particular the heavy, indeed clumsy, and often impenetrable style of the south Italian school with Ibn Ezra's much more elegant and readable Sephardi Hebrew.

9 Ronald C. Kiener, "The Hebrew Paraphrase of Saadiah Gaon's 'Kitab al-Amanat wa'l-I'tiqadat,'" *AJS Review* 11 (1986): 1–25; Y. Tzvi Langermann, "An Early Jewish Defense of Creationism," forthcoming in Haggai Ben-Shammai, Shaul Shaked, and Sarah Stroumsa, eds., *Exchange and Transmission across Cultural Boundaries: Philosophy, Mysticism and Science in the Mediterranean World.* It may be added here that we do not know where and when the early (pre-Tibbonian) translations of some writings by Isaac Israeli were made, but in my opinion, at least, they may belong as well to the corpus of works under discussion here.

as *Sefer Yerušalmi*, which, it turns out, may have been written in southern Italy during the period of interest. Close scrutiny of this text, he tells us,

> is instructive concerning the methods of scholars who lived at a historical juncture and a cultural meeting place and strove to integrate and complete, to combine and harmonize different traditions – between "east" and "west." This was a most vibrant and intensive cultural universe which transmitted ancient traditions and literature and, at the same time, sculpted and reshaped them. . . . This is of particular importance, since a great deal of our classical literary heritage – the halakhah of the Holy Land, aggadic midrash, and esoterica – has reached us through this channel.[10]

Bari was the home of the most important of the south Italian yeshivot. Like many other towns in the area, it was nominally under Byzantine rule for most of the ninth and tenth centuries, although local potentates of various sorts exercised real authority. For our purposes, it seems best to treat southern Italy and Sicily as a single cultural entity in which Byzantine cultural influence was strong, whoever the political or military authorities may have been, and that shared other features – notably close, direct(?), and long-standing contacts with the Land of Israel. Fretting over whether a given city or area was, at the time of our interest, under Byzantine rule would be an unhelpful distraction. At present, the most that we can say is that several circumstances suggest that the translations mentioned earlier, and perhaps others, were made in southern Italy: (1) the commercial and other relations that are known to have obtained between southern Italy and the Near East, especially the Land of Israel; (2) the presence of an Arabic-speaking population; (3) the strong impact that some of these writings later exercised on Ashkenazi Jewry, for whom southern Italy was a source of texts; and (4) several linguistic features, such as Hebrew usages similar to those found in early piyyut.

CYPRUS

Some communities may find their place in Byzantine history only for lack of any other home. Cyprus is a good example. We have some sporadic information about scientific interests of Jews from that island. Basil II (976–1025) brought a Jewish expert, "Moses of Cyprus," to Constantinople to settle a dispute among Christians concerning the calendar. Our only source for this episode is an Armenian chronicle. We possess no information at all about this Moses, his background, or origin – around that time, for example, Jews were fleeing al-Ḥākim's Egypt – nor can we say whether he was the only Cypriot Jew skilled in the sciences at the time.[11]

We do have one high-level scientific text: a few astronomical tables drawn up for the coordinates of Cyprus, with the epoch 1373. They are scattered through MS Vatican 381, a rich but horribly misbound astronomical codex, written in a variety of Byzantine hands, which must be studied in more detail than I can provide here. The canons are found on ff. 19a–28a. At the top of the first page, in a different hand, there is a partially decipherable heading that reads, "A Commentary to the New Tables of Don Alfonso . . . fixed for the year 1373 (?) since the birth of Jesus." Only two tables are said to have been computed for the latitude and longitude of Cyprus: a table for the length of daylight (maximum: $14;23^h$) and one for the rising times of the zodiacal signs. These are data that (unlike, e.g., planetary motions) are strongly dependent on the local geographical coordinates. Hence it is possible

[10] J. Sussmann, "An Ashkenazi Manuscript of the Yerushalmi and Sefer Yerushalmi," *Tarbiz* 65 (1996): 37–63, on pp. 60–1 (Heb.). For a very recent treatment, with new information especially about the connections between southern Italy and Ashkenaz, see Simcha Emanuel, *Fragments of the Tablets: Lost Books of the Tosaphists* (Jerusalem: Magnes Press, 2006), pp. 74–7 (Heb.).

[11] See Starr, *The Jews in the Byzantine Empire*, p. 61, and the documents exhibited on pp. 184–5.

that the author computed them for Cyprus and then inserted them into one of the full sets that were at his disposal. The codex contains tables from some well-known sets, such as the Alfonsine Tables, the tables of Isaac al-Ḥadib (drawn up for Sicily), the planetary tables of Isaac Israeli, and the Persian tables. The only authority mentioned by name in the canons is Abraham Ibn Ezra, whose views are cited twice in connection with astrology.

In the introduction to the canons, the author writes,

> After this, know that the tables that I have drawn up for you are for the island of Cyprus, whose longitude is 60 degrees and whose latitude is 36 degrees. Know that the epoch for these tables is midday Monday, the beginning of March 1373, according to the Christian reckoning. I computed radices for that day for the mean sun and moon, the lunar anomaly, the longitude of the node, the five planets, the apogees of the planets, and the radix of the height of fixed star that is called *espero segundo*, and the thirty-two stars that the astrologers require for their judgments, and you will find them arranged in tables.

It is interesting to observe, in particular with regard to the very limited goals of this chapter, that the author chooses Cyprus and Candia to illustrate the use of lunar eclipses to compute differences in terrestrial longitude. By the late fourteenth century neither was under the direct political control of the Byzantine emperors, but both still belonged very much in the Byzantine cultural orbit.

> I will now provide you with an example. We found an eclipse of the moon in the place for which these tables were drawn up, the longitude of Cyprus, which is 60 degrees, on August 22, 1374, in the Christian reckoning. (f. 21a) I found that the eclipse was at 9;30^{h} after noon, and I found that in the city of Candia it was 8;46^{h} after noon. I took the difference between the beginning of the eclipse in Cyprus and its beginning in Candia, which is 44 minutes < equivalent to> eleven degrees. So I subtracted eleven degrees from the longitude of Cyprus, which is 60 degrees, leaving 49 degrees. Thus the longitude of Candia is 49 degrees, and it lies to the west of the city of Cyprus. This suffices for us.

TRANSLATION ACTIVITY IN THE FOURTEENTH AND FIFTEENTH CENTURIES

In the late fourteenth and early fifteenth centuries there was an intense exchange of information between Jews and Greeks, as evidenced by translations to and from Greek. Recent studies of Anne Tihon and Raymond Mercier have illuminated the extent of these contacts.[12] There were at least three Greek adaptations of the *Six Wings* of Immanuel Bonfils, executed at Constantinople and on the island of Crete. The tables (*Luḥot ha-poʿel*) of Jacob Bonjorn were translated twice; the *Paved Road* (*ʾOraḥ selulah*) of Isaac al-Ḥadib, once. It should be borne in mind that, in Eugenikos's Greek version, *Luḥot ha-poʿel* are called "Italian tables." This exchange of information must be seen as part of the close contacts between the Jews of Crete and Italy, as well as the deepening relations between Byzantines and Italians in the wake of the Council of Florence in 1438. Part and parcel of this wider phenomena are Latin translations of hitherto unidentified Jewish astronomical texts that were executed in a Cretan-Venetian milieu.[13]

The importation and translation of scientific writings from Muslim lands, especially Persia, have received increasing attention. Jews participated in this activity, making some of these

[12] Anne Tihon and Raymond Mercier, *Georges Gemiste Plethon: Manuel d'astronomie* (Louvain-la-Neuve: Academia-Bruylant, 1998).

[13] Anne Tihon, "The Astronomy of George Gemistus Plethon," *Journal for the History of Astronomy* 29 (1998): 109–16, esp. pp. 115–16.

materials available in Hebrew.[14] This work continued into early Ottoman times. Moses ben Judah Galeno, a Jew connected with the court of Bayazid II, translated several works on astronomical instruments from Arabic into Hebrew.[15]

The only scientific work known to have been translated directly from Persian to Hebrew is the medical formulary, *Dhakhīra Khuwārizmshāhī,* by Zayn al-Dīn al-Jurjānī (d. 1136/7), preserved only in MS Paris BNF héb. 1169. Neither the name of the translator, nor the place or date of the translation, is known.[16] However, the unique copy is written in a Byzantine hand. Moreover, the *Dhākhīra* is cited by Elisha the Greek, a Byzantine scholar of the fifteenth century (see the next section).[17] In view of the close connections between Byzantium and Persia that have now been established, it seems most likely that this translation was executed in Byzantium.

ELISHA THE GREEK

An interesting figure in Byzantine Jewish science who also seems to have played an important role in general European cultural history is "Elisha the Greek" – this is how his name appears in the Hebrew sources.[18] He wrote two medical works. The first, *Mafteaḥ ha-refuʾah* (Key to Medicine), is a book of general theory; it survives in about a half-dozen manuscripts. Efraim Wust has shown that it depends heavily on the *Mūjiz al-Qānūn* of Ibn al-Nafīs and the commentary to it written by Sadīd al-Dīn al-Kazarunī, two of the more influential works in late medieval eastern Islamic medicine. The second work, an *Aqrabadhin* or medical formulary, is referred to in some manuscripts as Elisha's translation from the book of al-Samarqandī (d. 1222), another of the chief medical authorities in the Muslim East. However, Wust's study of the text shows that it is not a translation, but rather an independent treatise by Elisha, for which al-Samaraqandī was one of his main sources.[19]

A certain Jew by the name of Elissaios was an expert on Averroes and other commentators on Aristotle and a prominent personage at the court of the Ottoman sultans in Adrianople (Edirne). According to a hostile report, he was the teacher and seemingly the main influence on George Gemisthius Plethon, "the last of the Hellenes," and a person of some importance in the transmission of Greek culture to the Italian Renaissance. Inter alia, Plethon composed a manual of astronomy, accompanied by tables, which makes use of Hebrew sources.

All that we know of Elissaios is found in the report by a certain Scholarios, a bitter critic of Plethon, who mentioned the Jew in two letters written well after Plethon's death. The longer of the two accounts portrays Elissaios thus:

> [Plethon was] attracted by his skill as an interpreter of Aristotle. This Jew was an adherent of Averroes and other Persian and Arabic interpreters of Aristotle's works, which the Jews had translated into their language, but he paid little regard to Moses or the beliefs and observances which the Jews received from

[14] See Moritz Steinschneider, *Die Hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893; repr. Graz, 1956), pp. 536–8, for the translations of Shlomo Sharvit-Zahav, carried out in 1374–6 in Salonika and Ephesus, and p. 630 for Sharvit-Zahav's own tables.

[15] On Galeano see Y. Tzvi Langermann, "A Compendium of Renaissance Science: *Taʿalumot ḥoḵmah* by Moses Galeano," *Aleph* 7 (2007): 285–318; "Medicine, Mechanics and Magic from Moses ben Judah Galeano's *Taʿalumot ḥoḵmah*," *Aleph* 9 (2009): 353–76.

[16] Steinschneider, *Hebraeischen Übersetzungen*, p. 754.

[17] E. Wust, "Elisha the Greek," *Peʿamim* 41 (1990): 49–57, on p. 52 (Heb.).

[18] Bowman (*The Jews of Byzantium*, p. 162 n. 110) seems to hint at some connection between this Elisha (or perhaps even identity with) and Elisha Kalki, who penned marginalia to Abraham Ibn Ezra's *Sefer ha-Šem* in MS Vatican 105. There is no basis for this suggestion. In the medical works he is always referred to as "Elisha ha-Yevani." The name Elisha was not all that rare.

[19] Wust, "Elisha."

him. This man also expounded to Gemistos the doctrines of Zoroaster and others. He was ostensibly a Jew but in fact a Hellenist [pagan]. Gemistos stayed with him for a long time, not only as his pupil but also in his service, living at his expense, for he was one of the most influential men at the court of these barbarians. His name was Elissaeus.[20]

Nothing more is known of him.[21] Wust now offers the plausible suggestion that Elissaios is none other than "Elisha the Greek." It makes perfect sense that a rich and influential courtier would have been a physician; Elisha the Greek's familiarity with eastern Islamic medical literature certainly does not contradict Elissaios's mastery of Aristotle's Arabic and Persian commentators. If Scholarios can be believed and Wust's interpretation is correct, then we have here an interesting sociological portrait: a Jew who no longer practices his faith, who is expert in the science and philosophy of the Islamic tradition but also conversant in Greek, who achieves wealth and influence at the court of the sultans, and who counts well-bred Greeks among his pupils.

A most interesting treatise on logic, preserved uniquely in MS Moscow 1187 (which unfortunately is incomplete, with most of the second part missing), appears to be another, hitherto unknown work by Elisha. Although the identification of Elisha as the author is tenuous indeed, I will, in the following, speak of Elisha as the author. In any event, it is certainly a work of late Byzantine Hebrew science and is replete with references to eastern Islamic figures such as Ibn Sīnā, Fakhr al-Dīn al-Rāzī, and, especially, the scholars of the thirteenth and fourteenth centuries who carried on the work of those two major figures, with the debates that raged between them. The list includes several personalities and works that are rarely mentioned in Hebrew letters, or not at all: Naṣīr al-Dīn al-Ṭūsī (1200–74); the *Maṭāliʿal-anwār* by Sirāj al-Dīn al-ʿUrmawī (1198–1268); commentaries on the latter by Shams al-Dīn al-Isfahānī and Quṭb al-Dīn al-Taḥtānī, along with the *Shamsiyya* of al-Qazwīnī al-Kātibī (1220–76 or 1290), one of the most important handbooks of late medieval logic in the Islamic East; and Ibn Kammūna (d. 1284), who is referred to as "the author of the *Kāshif*," the encyclopedia better known as *al-Jadīd fī al-ḥikma*.[22]

The reasons that the author gives for writing his book are fairly standard: to provide a clear exposition in which abstruse matters become clear and errors are weeded out. He criticizes the extant Hebrew literature on logic on two fronts. First, the translations from the Arabic (Jewish writers' dependence on the Arabic tradition is manifest and explicit throughout this book) are infelicitous. This is not necessarily the fault of the translators, but rather an inevitable consequence of the lexicographical poverty of the Hebrew language. Elisha promises he will attempt to provide good Hebrew equivalents, but to be safe, he will also transcribe the Arabic terms and occasionally the Greek as well.

The second major criticism is that Hebrew treatises on logic tend to be overly concise, to the point of being incomprehensible. Although in his introductory remarks Elisha declines

[20] C. M. Woodhouse, *Gemistos Plethon, The Last of the Hellenes* (Oxford: Oxford University Press, 1986), p. 24; cf. Bowman, *The Jews of Byzantium,* documents 135 and 137 on pp. 313–14.

[21] The suggestions by Wust and Woodhouse, as well as the more recent musings of Polymnia Athanassiadi ("Psellos and Plethon on the Chaldean Oracles," in Katerina Ierodiakonou, ed., *Byzantine Philosophy and its Ancient Sources* [New York, 2004], pp. 237–52, on pp. 248–50) concerning Elissaios's philosophical allegiances and ultimate fate, however well reasoned, remain very much within the realm of conjecture. For counter-evidence to the specific claim of Ishraqi influence, see the later notes.

[22] For a basic biography and bibliography of these figures see the second part of Nicholas Rescher, *The Development of Arabic Logic* (Pittsburgh: University of Pittsburgh Press, 1964); the flowcharts and classification into "easterners" and "westerners" found in the first part (esp. pp. 74–5) are less helpful. Post-Avicennan logic remains for the most part uncharted territory.

to name the Hebrew authors who are the targets of his criticism, in the course of the work he reprimands one writer by name: Joseph Kelati, another Byzantine philosopher-scientist.[23]

Elisha's book, he promises, will contain a mixture of the old and the new. In addition to the "moderns" who have been named earlier, Elisha cites older authorities, such as al-Fārābī, Westerners (Ibn Rushd), and of course Aristotle (see the section on "Aristotelianism"). Indeed, he observes that much of the novelty that authors proclaim for their books is only a façade, a device to justify their own contributions. In some matters Elisha professes his conservatism. For example, he will include the *Categories* in his book, in line with the positions of Aristotle, al-Fārābī, Ibn Rushd, and Ibn Sīnā of the *Shifāʾ*, even though Ibn Sīnā changed his position in his subsequent writings. In the second part – most of which is unfortunately missing – he promises to explain why, in fact, the moderns are correct in excluding the *Categories* from the logical corpus. In the first part, however, which contains his exposition of the science, he will nonetheless tread the path of the ancients.

Elisha (if he is the author) regards logic as a science in its own right and not merely as a tool to be employed in the other sciences. He knows that this is a controversial issue, anticipates objections, and replies to them. He also lays before the reader a lengthy discussion of epistemology, rejecting the view of Fakhr al-Dīn in favor of the "ancients." In this regard, it is important to point out that there is no trace in the book of the Ishraqi philosophy – neither its illuminationist epistemology nor its own distinctive logic.[24] A number of writers have speculated, on the basis of the reports of his "paganism" and Plethon's involvement with Zoroaster, that Elisha was attracted to the Ishraqi philosophy; at present, however, there is no evidence at all to back this up.

MOSES "THE EXILE" OF KIEV AND HEBREW SCIENCE IN MEDIEVAL RUSSIA

There seem to be some good reasons for including the information that we have about science among Jews in Russia, especially in the field of astronomy, within our overview of the Byzantine world. From the most general perspective, Russia absorbed much from Byzantium in the areas of culture and religion; the only episode relevant to our theme concerns a sect of "Judaizers" who, among other things, supposedly interfered with the traditional calendar, basing themselves on the *Six Wings*, a short manual for solar and lunar computations written by a Jew, Immanuel of Tarascon (Bonfils). We have already seen that *Six Wings* was translated into Greek; the tract was rendered into Russian as well.[25]

However, the precise role of *Six Wings* in this episode and indeed the identity and agenda of the "Judaizers" remain the subject of much controversy. We do not know precisely how this particular text (and others as well) reached Novgorod, Kiev, and/or Moscow. Some key figures certainly visited points east (Damascus, Jerusalem). In particular, we do not know whether the Russian translation was made from the Hebrew and not from the Greek. In view of the close connection between the Russian and Greek churches and, I may presume, a shared rise of eschatology in the wake of the fall of Byzantium, one might tentatively suggest a

[23] Kelati is an interesting figure in his own right, judging from his extant works, all in manuscript, of course. His treatise on logic, *Minḥat Yehudah,* is extant in three manuscript copies; see further Chapter 5 by Charles Manekin in this volume. He is also the author (according to E. Kupfer, in *Fifth World Congress of Jewish Studies* [Jerusalem, 1969], on p. 137 [in Hebrew]), of a philosophical text, unfortunately incomplete, that gives particular attention to the constitution of the heavens; it is found in MS New York, Columbia University X893 F843.

[24] On Ishraqi logic see, e.g., Hossein Ziai, *Knowledge and Illumination* (Atlanta: Scholars Press, 1990).

[25] The most detailed discussion of Hebrew astronomical manuscripts connected with this episode is Moshe Taube, "The Kievan Jew Zacharia and the Astronomical Works of the Judaizers," *Jews and Slavs* 3 (Jerusalem, 1995): 168–96; see now also *idem,* "Transmission of Scientific Texts in 15th-Century Eastern Knaan," *Aleph* 10 (2010): 315–53.

connection between the interest in Russia in the *Six Wings* and its popularity in Byzantium.[26] To be even more specific, we know that a copy of (the Hebrew) *Six Wings* was in the possession of Moses ben Jacob of Kiev, a prolific writer on kabbalah and philosophy, and certainly the Russian Jew of the period whose scientific activities are best known. Moses recorded that he purchased his copy for the sum of thirty *levanim* from Shemaryah [of] Saloniki in 1471.[27] Hence he acquired his copy from a Jew from the former Byzantine heartland.

I have had the good fortune to inspect a copy, unique and unfortunately very incomplete, of Moses' own astronomical treatise, *Yesod ha-ʿibbur*, preserved in MS St. Petersburg, Oriental Institute C 97, ff. 209a–238b. Moses is generally known as *ha-goleh* (the exile). At the end of our treatise there is a long, sad, and passionate account of his banishment from Lithuania in 1495. Eventually, he found refuge in Belz. The title of the treatise, which may be translated "Principle of Intercalation," would lead one to believe, erroneously, that it is a work on the calendar. Although the first of its four sections is indeed concerned with the Jewish calendar, section two deals with lunar visibility, section three with planetary motions, and section four with the astrological houses, sundials, and a variety of other topics. Moses informs us that he draws on earlier sources, but that his treatise also contains new contributions of his own.

The second section appears to owe a great deal to Maimonides. In particular, chapter nine is devoted to explicating some difficult passages in Maimonides' *Hilḵot Qidduš ha-ḥodesh*, whereas chapter ten responds to some misinterpretations of Maimonides by a certain Rabbi Lipman. This section contains (on f. 212a) an equatorium-type figure. These figures are common enough in late medieval and Renaissance Latin texts, but I cannot recall any other example in Hebrew texts. The third section is very incomplete. For reasons that remain unclear to me, Moses evidently decided to compile planetary tables according to the nineteen-year cycle of intercalation. Although this treatise certainly merits close examination, I fear that the poor state of its preservation will place a severe limit on the amount of information that can be extracted from it.

ELIJAH MIZRAḤI (1435?–1526) AND THE *ALMAGEST* COMMENTARY TRADITION

Elijah Mizraḥi succeeded Capsali as head of the Jewish (Rabbanite) community in Constantinople. His halakhic responsa carried great weight; he also composed a widely read supercommentary on Rashi's Torah commentary.[28] Though he worked under Turkish rule, the character of the text described in this section places him firmly within the tradition of Byzantine Hebrew science. In the field of the exact sciences, he wrote a handbook on arithmetic, *Sefer ha-Mispar,* another major success in terms of readership, print editions, and diffusion. One would certainly welcome a comprehensive study of this individual. In keeping with the guidelines for this study, I merely describe an important text that has yet to receive any significant attention: Mizraḥi's very lengthy (more than 200 folios) commentary on Ptolemy's *Almagest.* The unique copy is found in MS St. Petersburg, Oriental Institute C 128. The copyist, Menaḥem ben Moses, apologizes for possible mistakes, because he used a copy "that had all sorts of different handwritings and strange letters" – perhaps Greek or Arabic?

[26] Two recent discussions that take note of *Six Wings* are Constantine Zuckerman, "The 'Psalter' of Feodor and the Heresy of the 'Judaizers' in the Last Quarter of the Fifteenth Century," *Harvard Ukrainian Studies* 11 (1987): 77–99; and Joseph L. Wieczynski, "Hermetism and Cabalism in the Heresy of the Judaizers," *Renaissance Quarterly* 28 (1975): 17–28. I have not seen Philippe Gardette, "Judaeo-Provençal Astronomy in Byzantium and Russia (14th–15th C.)," *Byzantinoslavica* 63 (2005): 195–209.

[27] MS Vienna, Austrian National Library, catalogue Schwartz 183; see catalogue, pp. 207–8.

[28] Mizraḥi's gloss-on-a-gloss is now enjoying a resurgence in popularity and has been reprinted several times.

Like all medieval commentators, Mizraḥi paid close attention to establishing correct readings in the text that he was scrutinizing. However, unlike any other writer I know of in the Greco-Arabic scientific tradition, Mizraḥi was fluent in the three languages necessary for this work. He refers to the Greek text (f. 134a), to the Arabic version (ff. 83b, 95a, and some fifteen other places), and, of course, to variant readings in the Hebrew (f. 64b). In this connection, it is interesting that he cites Ibn Rushd's "reading" (*nusḥah* [f. 60b]), though he can be referring only to Ibn Rushd's abridgment of the *Almagest*, which he cites explicitly (e.g., on f. 88a–b).[29]

Ibn Rushd is cited quite frequently, almost always in a critical – at times very critical – vein. Mizraḥi also cites with disapproval Jābir ibn Aflaḥ; apparently he had strong reservations about Andalusian astronomy, but this must be investigated in more detail. He also mentions *ha-ʾiš ha-marʿiš*, apparently al-Biṭrūjī, "and those who followed him," which probably refers to the author of *The Light of the World*; both of these works were available and studied in Constantinople at this time.[30]

We may cautiously single out some issues in the *Almagest* that seem to have been of particular interest to Mizraḥi. For example, there are very detailed glosses to the table of chords (*Almagest* I.11) and the instruments used to determine the obliquity of the ecliptic (I.12), accompanied by finely drawn figures. Ptolemy's "astrolabe," which he describes at the beginning of book V, is also given a long detailed commentary.[31] Here again I may refer to my study of Moses Galeano; in the early sixteenth century there was a surge of interest in astronomical instruments. This particular phenomenon is connected with the interests of the new rulers, the Ottoman sultans.

Mizraḥi does not neglect questions of cosmography and the physics of the stellar motions (163a ff.). He takes up the topic in a long gloss to *Almagest* V.2, where Ptolemy introduces his second lunar model, which is designed to deal with the lunar evection. Mizraḥi hones in on the passage where Ptolemy states (according to the Hebrew text that he saw) that "in this plane that is in the lunar deferent orb there are two motions in two opposite directions, each of which is uniform. Both are about the center of the ecliptic. One of them rotates the center of the epicycle in the direction of the signs."[32] This is, in fact, the place to raise an objection. As Olaf Pedersen observes, "This is the first instance where Ptolemy violates the principle of uniform, circular motion in the strict sense . . . without even mentioning this departure from a fundamental dogma in the philosophy of astronomy."[33]

Mizraḥi reports two doubts that have been raised and then offers responses of his own in defense of Ptolemy. The first of these doubts is based on the analogy of the revolution of the orbs to that of a millstone. However, the specific objection seems to me to be quite peculiar. One and the same line (or vector) cannot move the orb in opposite directions, "because it has already been proven in natural science that there must be a [moment of] rest between two opposite motions. But the orb cannot be at rest for even an instant!" In other words, the concern here is not with any demand that astronomical models employ devices that

[29] This is clear (e.g., f. 8a), where he notes that Ibn Rushd excised one of Ptolemy's arguments that the stellar motions take place on a spherical surface.

[30] See Langermann, "Compendium of Renaissance Science."

[31] Ptolemy calls the instrument *astrolabon*, but it is in fact an armillary sphere; see G. J. Toomer, *Ptolemy's Almagest* (New York: Springer, 1984), pp. 217–19.

[32] For purposes of comparison I cite the passage in Toomer's new translation from the Greek (*Ptolemy's Almagest*, p. 220): "Now, in this inclined plane, we suppose two motions to take place, in opposite directions, both uniform with respect to the centre of the ecliptic: one of these carries the centre of the epicycle towards the rear through the signs with the speed of the motion in latitude, while the other carries the centre and apogee of the eccentre, which we assume located in the in the same [inclined] plane."

[33] Olaf Pedersen, *A Survey of the Almagest* (Odense: Odense University Press, 1974), pp. 186–7.

always move in the same direction, or with the complaint that geometrical segments cannot impart motion to physical bodies. Instead, it is that old bugaboo of medieval physics, *quies media.*

Mizraḥi's reply is no less interesting: "[The objection would hold true] were the surface of the inclined circle, which carries the center of the epicycle, a continuous, hard, non-elastic (*bilti mitpazzer*) body, from one end to the other, like a stone millstone, iron, and the like. However, the surface of the inclined circle is not like this. Instead, it is airy and sponge-like, not solid." The question, whether the heavens (or the intercelestial substance) were hard and solid, or soft, spongy, or even liquid, was frequently debated, especially in the Latin tradition. It is surprising, to say the least, to see Mizraḥi propose the sponginess of the heavens as a way out of the conundrum to which he has called attention.

The second objection is even less clear, though I think the reply is comprehensible. Mizraḥi writes,

> The second doubt is [this]. It follows necessarily from this assumption that the distance of the epicyclic center from the earth always remain the same, because the line drawn from the center of the earth, which is the center of the ecliptic orb and which sets the epicyclic center in motion, moves that center always at the same distance around the center of the earth, because all of the lines drawn from the center to the circumference are always equal. Therefore, the center of the epicycle will not come nearer at times, at other times move farther away; but this contradicts what he says.

In Ptolemy's second lunar model, the deferent vector – the line drawn from the deferent center to the center of the epicycle – is of a fixed length, but because the deferent center moves about the center of the earth on a small circle (whose radius is the eccentricity), the line drawn from the center of the earth to the center of the epicycle varies in length. This is Ptolemy's so-called crank mechanism, designed for the express purpose of having the epicycle approach the earth at quadrature. There may be cause to question the legitimacy of this device, but Mizraḥi's "doubt" is that it will not work.

In his reply, however, he shows that he understands quite well how the model works. Mizraḥi notes correctly that, because the motion of the epicyclic center about the earth is uniform, its motion relative to the deferent center is non-uniform. Because the motion of the deferent center is unidirectional, that is to say, "it is unchanging in its motion from east to west, then it necessarily follows from this that the center of the epicycle approaches and recedes from the earth." Interestingly enough, then, Mizraḥi quite explicitly allows non-uniform motion.

Medieval physical objections to the Ptolemaic models are well known today. However, Mizraḥi's comments, taken together with some remarks by Moses Galeano, who worked in Constantinople a half century earlier, reveal a debate that differs considerably from that known from the writings of Ibn al-Haytham or Maimonides.[34] Neither of those thinkers cites the passage from *Almagest* V.2. They do not raise the fluidity of the heavens as a possible solution, nor would they explicitly allow non-uniform motion, though clearly they knew it was part and parcel of the Ptolemaic models.

Mizraḥi's commentary links up with two other features of Byzantine Hebrew science (though of course by no means limited to the Byzantines) that ought to be mentioned here. The first is the detailed, lengthy commentary to works in the exact sciences. Caleb Afendopolo wrote a lengthy commentary on Nichomachus's *Arithmetic*, which has been surveyed quite well by Moritz Steinschneider. The only other Hebrew commentary of similar

34 Ibn al-Haytham skips over the problematic passage in *Almagest* V.2 in his landmark *al-Shukūk ʿalā Baṭlamyūs (Dubitationes in Ptolemaeum)*, ed. A. I. Sabra and N. Shehaby (Cairo: Dar al-Kutub, 1971), though he objects at great length to the prosneusis described later in the same fifth book. Maimonides discusses the cosmological quandary in his *Guide of the Perplexed,* II.24.

length and depth is the (as-yet unstudied) commentary on the *Almagest* by Samuel ben Judah, the famous translator from Marseilles; the unique copy is found in MS Vatican 398.

Commentaries on the *Almagest* are the second feature. Although I cannot display statistics proving that this was a Byzantine "specialty" (even if I have a suspicion that this was the case), I can at least call attention to relevant manuscript materials. These include a glossed copy of the *Almagest* (MS St. Petersburg, Academy D 33, with references in the margins to Pappus, Mizraḥi, and Komatiano) and some fragments of commentaries in Byzantine script (e.g., MS Paris BNF héb. 1047, ff. 139b–144a; MS Vatican 384, 156b–157b; MS Hamburg 113, 28b–41a) whose full scope can only be guessed.

AN ASTROLOGICAL SUMMA: *ʾURIM VE-TUMMIM*

MS Vatican 393 contains *ʾUrim ve-Tummim*, the longest, most comprehensive, and, in some ways, the most ambitious treatise on astrology written in Hebrew. It is written in an Ashkenazi-Byzantine hand and, I believe, is an autograph. The author identifies himself as Moses ben Samuel Cohen. In the introduction (f. 137a) he notes that 5,226 years have passed since creation, so the book was written, or at least begun, in 1465/6. Much later in the treatise there is a star table, displaying longitudes for A.M. 5233 = 1472/3 C.E. Thus our author worked on his book over a period of several years at least. Moses refers to several other of his writings. One of these, a philosophical tract on free will, God's knowledge, and other issues (mentioned on f. 136b), is extant in MS Sassoon 38, pp. 330–45, where the author gives his full name: Moses Barukh. He is also very likely the same Moses Ashkenazi Cohen who was involved in a debate over the transmigration of souls (*gilgul*) with Michael Balbo.[35]

The philosophical aspects of Ashkenazi Cohen's astrology are very interesting, and I hope to be able to explore them in depth on some other occasion. He was a firm opponent of kabbalah; astrology was important to him, I believe, insofar as it buttressed an alternative system of religious philosophy. Ashkenazi Cohen held that there was a religious obligation to know astrology, because only with the help of astrology can one exercise free will properly. To modern ears this will surely ring as a contradiction in terms, but in fact the reasoning is clear and in some ways compelling. In its Jewish context, free will means, at the bottom of things, the capacity to do what is right and good; far from legitimizing caprice, free will underpins the obligation to do what is suitable for worshiping God – the biblical "choose life!" Because people have different constitutions, inborn talents, and astral trajectories, only those who know astrology can know themselves well enough to make the proper decisions for their own lives.

The treatise offers very little in the way of mathematical astrology. Indeed, the computations offered by way of illustration that I have inspected are all taken from Ibn Ezra. Ashkenazi Cohen collects and tabulates the positions, magnitudes, and "mixtures" of some fifty stars that Ibn Ezra listed, as appropriate, at the end of each of the paragraphs on a zodiacal sign in the second chapter of his *Reʾšit ḥoḵmah.* He updates the longitudes for the year A.M. 5233=1472/3 C.E., using a rate of one degree per seventy years. This is the only original computation that I have found in the treatise. Two other tables should be mentioned.

35 Benjamin Richler was immensely helpful in putting together Ashkenazi Cohen's bibliography. The *gilgul* debate was first studied by Efraim Gottlieb, "The Gilgul Debate in Candia," *Sefunot* 11(1969): 45–66 (Heb.; repr. in idem, *Studies in Kabbalah Literature* [Tel Aviv: Tel Aviv University, 1976], pp. 370–96). See also E. Kupfer, "Concerning the Cultural Image of Ashkenazi Jewry and Its Sages in the Fourteenth and Fifteenth Centuries," *Tarbiz* 43 (1973): 113–47, esp. pp. 125–7 (Heb.).

A list of the horoscopes of selected cities partially overlaps the lists given by Ibn Ezra in the two versions of his *Sefer ha-ʿOlam*. However, Ashkenazi Cohen tabulates data for cities not mentioned by Ibn Ezra, for example, Shiraz, Hamadan, Sarkhas, and other places east of Byzantium.[36] Ashkenazi Cohen also tabulates two lists of the lunar mansions, each with its own particular set of dot patterns. One is said to derive from the Latin ("Roman") version of al-Farghānī; the source of the other is not named, but the names of the mansions are not taken from the list found in Ibn Ezra's *Keli neḥošet*.[37]

Although some of the astrological data are worth pursuing, the main interest of the treatise lies in its justification of astrology. In this connection, Ashkenazi Cohen applies an interesting hermeneutic to Maimonides. According to him, Maimonides contradicts himself, rejecting astrology in the *Mishneh Torah* but endorsing it in the *Guide*. On top of this, there are some internal contradictions within the *Guide*. These contradictions are instances of the fifth and seventh causes, that is, the two classes of contradiction that, as Maimonides alerts his readers, are deliberately applied in the *Guide*. The reason for this obfuscation is that Maimonides wishes to adopt two contradictory doctrines. In the *Mishneh Torah* he emphasizes human freedom of action to assure the average Jew that he will be rewarded for making the proper choices with regard to the commandments and prohibitions of the Torah. In the *Guide,* however, Maimonides must reckon with the difficult issues of divine providence and omniscience, and these cannot be accommodated without the idea of astral governance.

To resolve the question of Maimonides' true stance toward astrology, Ashkenazi Cohen invokes a third source. According to him, Maimonides makes known his endorsement of astrology unambiguously in the introduction to his *Megillat setarim*. There is a pseudo-Maimonidean treatise by that name in which the great master supposedly endorses the kabbalah.[38] However, the quotation provided by Ashkenazi Cohen is not found there, nor is that tract likely to have been his source, given his outspoken opposition to the kabbalah. It is much more probable that he is citing from an as-yet-unidentified version of the pseudo-Maimonidean alchemical treatise that usually goes by the name *ʾIggeret ha-sodot*.[39] The key passage states,

Everything that you find among the laws of nations and their religions which disallows bad practices is divided into two species, which fall under a single genus.

One species is the harm one person [does] to another. An infinite number of individual [cases] fall into this class. The other species comprises things that are looked upon [unkindly?] by most people,

[36] City horoscopes were an important topic in Renaissance astrology, but I can find very little on the topic for the medieval period. The best-documented case is that of the foundation of Baghdad; see David Pingree, "The Greek Influence in Early Islamic Mathematical Astronomy," *Journal of the American Oriental Society* 93 (1973): 32–43, on p. 37. Additional pertinent information can be found in these sources: A. Bouché-Leclerc, *L'Astrologie grecque* (Paris, 1899), pp. 368–9; D. Pingree, "The Horoscope of Constantinople," in Y. Maeyama and W. G. Salzers, eds., *ΠΡΙΣΜΑΤΑ. Naturwissenschaftsgeschichtliche Studien. Festschrift für Willy Hartner* (Wiesbaden: Franz Steiner Verlag, 1977), pp. 305–15; A. T. Grafton and N. M. Swerdlow, "The Horoscope of the Foundation of Rome," *Classical Philology* 81 (1986): 148–53; Mary Quinlan-McGrath, "The Foundation Horoscope(s) for St. Peter's Basilica, Rome, 1506: Choosing a Time, Changing a Storia," *Isis* 92 (2001): 716–41. Clearly, there were some sources available to both Ibn Ezra and Ashkenazi Cohen that have not yet come to the attention of modern scholarship. I hope to return to this topic at some future opportunity.

[37] Concerning these dot patterns, see Emilie Savage-Smith and Marion B. Smith, *Islamic Geomancy and a Thirteenth-Century Divinatory Device* (Malibu: Undena Publications, 1980), especially the table on pp. 40–1.

[38] This treatise was first published by H. Edelmann in *Ḥemdah genuzah* (Koenigsberg, 1816) and reprinted several times since.

[39] Raphael Patai devotes the twenty-fourth chapter of *The Jewish Alchemists* (Princeton: Princeton University Press, 1994) to a discussion of this treatise, including a translation of the entire opus; I also inspected the copy of the original in MS Munich 214. Nowhere did I find the passage cited by Ashkenazi Cohen.

with the exception of the sect of scholars – who should not even be called a sect, since they are so few; but rather [they are designated a sect] the way the sun is called a species, even though it constitutes a single item. These practices would cause everyone to turn his heart away from the ways of nature, because everyone tends so much to place his trust in those [non-natural] ways. He will also trust in God (??).

This species includes the practice of alchemy, talismans, astrology, and the like. Were these things to be placed before the usual sort of people, they would abandon all worldly matters as well as natural habits, like plowing, planting, and the rest, out of their great longing for those astonishing things, and their great reward for very little effort. The world would become desolate.

This was the intention behind my concealing these matters from every creature, to the point that I said, let them perish along with me! But now that I have seen your comportment, I recognize in you the signs of someone worthy of a secret, crowned with wisdom; and if I were to inform you about this matter, I would be helping you. The reason for informing you is the very reason for your great wisdom. Were I not to inform you, I would not gain anything, but I would be harming you. I saw that, after all, if I were to refrain from informing you, that would be [the manifestation] of a character trait which is nothing other than a bad habit of the soul, namely jealousy.

Ashkenazi Cohen sees no contradiction between astrology and free will. On the contrary, astrology allows one to exercise free will wisely, by unveiling to each person the medical, professional, financial, and other possibilities in his or her chart. The relatively smooth course in life such knowledge allows is not to be enjoyed for its own sake. Rather, in keeping with the imperative of medieval Jewish philosophy, one must avoid unnecessary troubles so as to concentrate all of one's efforts on *ʿavodat ha-sekel*, worship by way of the intellect.

Nor does astrology allow or excuse any evasion of responsibility. At the beginning of the second section of the book *Tummim*, Ashkenazi Cohen makes one of the most forceful pleas for personal accountability that I have encountered in medieval Jewish literature. The fact that this is done in the course of – indeed as the driving wedge for – a defense of astrology is extraordinary, to say the least. Here is a sample of his preaching (f. 206a):

Thus whoever is sincere (*tamim*) with his God and His Torah will remove from his eyes the mask of blindness, and the habitude that prevents the eyes from seeing. He will not perform the commandments and human actions like a blind person who gropes in the dark, performing the precepts by rote,[40] without aiming from the start for their ultimate goal. Every person must open his eyes, and foresee the outcome; he should choose the proper action, and actually do it, as well as [identifying] the bad action, which he should keep himself from doing. This is the trait for which one receives reward.

ARISTOTELIANISM

Aristotelianism seems to have held sway in Byzantium; for example, it seems to have led Komatiano to interpret some of Ibn Ezra's decidedly non-Aristotelian monographs in an Aristotelian vein.[41] Telling passages in Byzantine writings make explicit their authors' preference, indeed extremely high regard, for Aristotle. The first of our selections comes from a commentary on the *Physics*. In Byzantium, as elsewhere in the Jewish world, Aristotle's text was studied most often through the intermediary of Ibn Rushd's commentaries and, to a lesser extent, by way of Gersonides' supercommentaries on them. Here is what Michael ben Elijah Cohen has to say about the Stagirite (MS Vatican 344, ff. 19b–20a). It is not only an

[40] The phrase means to perform the commandments out of force of habit, without giving any thought at all to what it is that one is doing.

[41] I have in mind his commentaries to *Sefer ha-Šem* (MS Paris BNF héb. 681) and *Sefer ha-ʾEḥad* (MS St. Petersburg Academy A 221), neither of which has been published.

evaluation of Aristotle's achievement; it is also an important statement about the criteria for novelty or invention to a medieval thinker:

Michael said: It has already been said that Aristotle invented these three sciences, I mean, logic, physics [*lit.* natural (science)], and metaphysics [*lit.* divine (science)]. He brought them to perfection, because no one who preceded him achieved what he achieved. Even though some of those who preceded him, such as Plato and Socrates, did achieve something, what they attained was not at all like what he did; and what he attained was not like what they did. Indeed, some falsity remains in them [i.e., in the teachings of Plato and Socrates].

Since this person [Aristotle] put together what belongs to species into species, and what belongs to genera to genera, thereby putting order into the art [*lit.* making an artificial order there], we then say that he invented the arts.

As for his being the one who perfected them: it is because one cannot find anyone, in [all of] the time after him, who followed the path that he [Aristotle] took in any way so as to add a teaching to what this person [Aristotle] taught. This being so, the existence of such a person is a wonder. He is indeed worthy of being called divine.... This is applicable to him alone, since he is the one who brought [physics] to perfection.

A similar appraisal is given by the author of the logical treatise discussed earlier, whom we suppose to be Elisha. Like Michael, he is at pains to explain what the ancients meant when they called Aristotle "divine." They may have used that term because of their acquaintance with Greek texts, where the epithet *theios* (divine) was frequently attached to extraordinary sages, especially Plato. However, the adjective was also used in Arabic. Maimonides offers an explanation of his own in his commentary to Mishnah Avot 5:13: "The philosophers say that it is rare and difficult to find an individual like this [who combines all the intellectual and moral virtues], but that it is not impossible. If he is found, then they call him a divine person (*insān ilāhī*), and so also is he called in our language *ʾiš ha-ʾelohim.*"

Here is what Elisha has to say about Aristotle:

Ḥunayn ben Iṣḥāq said that the science of logic is a science that the wise Aristotle founded. Before him, this science did not exist. The little that there was, was in error. Aristotle found fault in some of the things that the ancients said, because they did not adhere to the ways of logic, as you may find him [saying] in his disagreements with Plato and other ancients. The intellect of this wise man [Aristotle] attained such a great level that the ancients called him "divine" and someone who possessed the holy spirit, because he was able to grasp on his own that which others were not able to grasp [even] by study.

The truth in such matters is that if a person receives the divine efflux, bringing his intellect to perfection, so that he actualizes its potentiality, it [the divine efflux] clarifies for him the paths of truth and reveals to him the secrets of reality. He, then, is the one who is crowned with the crown of prophecy, or with the holy spirit, or, in the language of the sages.... [42] He has no need of logic, because all of the items of knowledge are obvious to him, and all the premises are primary.[43] His intellect moves from problems to premises [needed for their solution] and from them [back to] the problems without any temporal motion, that is to say, instantaneously.

Here Elisha describes in detail the four stages or ranks in human cognition, culminating in the highest stage, which he has just described: the person who instantaneously arrives at the correct solution to whatever problem he seeks to solve. In Arabic, this effortless acquisition of knowledge is referred to as *ḥads*, which is usually translated as "intuition." Islamic thinkers of the thirteenth century in particular studied this concept, which they found to be a good

[42] Here there are three Hebrew letters at the end of the line, and another three at the beginning of the next, which make no sense to me.

[43] Items of knowledge are *hekreḥiyim* (i.e., they are so obviously true that the mind accepts them spontaneously, with no need for a temporal process of cognition). All premises are primary (i.e., first intelligibles), intuitively and immediately known to be true.

psychological explanation for the phenomenon of prophecy. Now just how or why someone like Aristotle, who was blessed with this gift, should have invented the science of logic is a mystery. Perhaps he did it at an early stage of his career, before he attained perfection, or perhaps he did it as a public service. In any case, the passage is good testimony to the very high esteem in which Aristotle was held among Byzantine Jews.

22

Philosophy and Science in Medieval Jewish Commentaries on the Bible

James T. Robinson

During the Middle Ages – the age of commentary par excellence – four distinct methods of Jewish biblical exegesis developed. These methods, formalized in the thirteenth century, were designated by the acronym PaRDeS. The four methods were *peshat,* the literal/grammatical/historical/contextual method of interpretation; *remez,* the philosophical/allegorical approach; *derash,* the method of rabbinic midrash; and *sod,* the esoteric method of the kabbalists, who read the Bible through the ten *sefirot,* the names of God, and letter permutations.[1]

This chapter introduces the second of these four canonical methods of interpretation. It surveys the main philosopher-exegetes and schools of thought during the Middle Ages by their period and geographical location. These include the rise of philosophical-theological exegesis in the Islamic East; the exegetical traditions of the Islamic West, especially in al-Andalus; the Maimonidean traditions in Provence, Italy, and to a lesser extent Christian Spain; and the post-Maimonidean developments in Egypt, Iraq, and Yemen. The final section focuses on anti-philosophical and anti-Maimonidean traditions of exegesis. These traditions developed in the thirteenth and fourteenth centuries, often as a direct response to the spread of Maimonideanism, and continued into the fifteenth century, when Jews were influenced by contemporary trends of anti-Aristotelianism.

One preliminary note about terminology: The survey focuses on philosophical exegesis in general, but attempts to single out examples that relate to subjects of scientific interest in a more narrow sense. In the Middle Ages, philosophy included what we call today "science," that is, discussions based on or related to empirically observed phenomena. In addition, it should be noted that a complete survey of the history of philosophy and exegesis would need to consider a wide variety of sources, including philosophical and theological summas, polemical tracts, controversial letters, popular literature, philosophical sermons, and proper commentaries on the Bible. In this chapter I focus primarily on biblical commentaries, with only occasional reference to the cognate literature. A complete study of all the relevant literature would require a much larger investigation.

[1] I would like to thank Gad Freudenthal, Angela Jaffray, and Tzvi Langermann for many helpful comments and suggestions. For the history of PaRDeS, see especially F. Talmage, "Apples of Gold: The Inner Meaning of Sacred Texts in Medieval Judaism," in A. Green, ed., *Jewish Spirituality: From the Bible to the Middle Ages* (New York: Crossroad, 1986), pp. 313–55; and most recently M. Idel, *Absorbing Perfections: Kabbalah and Interpretation* (New Haven: Yale University Press, 2002), pp. 429–37.

THE ISLAMIC EAST

The history of medieval Jewish philosophy, science, and exegesis begins in the Islamic East. Under the influence of Christian and Islamic traditions and in response to the spread of philosophy, a distinct Jewish commentary tradition developed.

What was the character of early Islam, and how did it contribute to a Jewish exegetical tradition? During the first three centuries of Islam, a remarkably open intellectual environment developed. The conquest of Iran, Iraq, Syria, Palestine, and Egypt brought the ancient centers of learning under the rule of Islam. Arabic became the common language, but separate religious groups continued to thrive. In particular, Jews, Christians, and Zoroastrians were protected and were allowed to continue their traditions. Although Greek paganism was not tolerated, the classical texts were translated into Arabic and stimulated the development of an Arabic philosophical and scientific tradition.[2]

This open cultural and intellectual environment produced some interesting results. Freethinkers such as al-Rāzī, among the Muslims, and Ḥiwi al-Balkhi, among the Jews, wrote critiques of traditional religion and Scripture.[3] Philosophical and theological sessions took place in the mosques and included members from all the different traditions: The only requirement for participation was that one check religious dogma at the door.[4] In response, there developed Islamic theological and exegetical traditions interested in using philosophy to explain Scripture, or to defend Scripture against philosophy. Most famous is the Muʿtazilite school of Kalām, which aimed to show that Scripture is not inconsistent in any way with the findings of reason.

This fluid and open cultural setting is exemplified in the life and work of the first known Jewish verse-by-verse commentator on the Bible. Dāwūd al-Muqammis (ninth century) converted to Christianity and studied in the Christian schools before returning to the religion of his fathers.[5] In addition to his theological summa, entitled *Twenty Chapters,* he also produced Judeo-Arabic commentaries on Genesis and Ecclesiastes. Only one fragment of the Genesis commentary survives, but as a later report testifies, al-Muqammis drew extensively from the Syriac tradition.[6] Thus this early Judeo-Arabic commentary on the Bible grew out of a direct encounter with Eastern Christianity.[7]

[2] For background on all these developments, see J. Kraemer, *Humanism in the Renaissance of Islam: The Cultural Revival during the Buyid Age* (Leiden: Brill, 1986); idem, *Philosophy in the Renaissance of Islam: Abū Sulaymān al-Sijistānī and His Circle* (Leiden: Brill, 1986); D. Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early Abbasid Society (2nd–4th/8th–10th Centuries)* (London: Routledge, 1998).

[3] For al-Rāzī and other "heretics" in Islam, see S. Stroumsa, *Freethinkers in Islam: Ibn al-Rāwandī, Abū Bakr al-Rāzī, and Their Impact on Islamic Thought* (Leiden: Brill, 1999). For Ḥiwi, see I. Davidson, *Saadia's Polemic against Hiwi al-Balkhi* (New York, 1915); J. Rosenthal, "Ḥiwi al-Balkhi – A Comparative Study," *Jewish Quarterly Review* 38 (1947/8): 317–42, 419–30; 39 (1948/9): 79–94.

[4] For reports about the *majālis*, see, e.g., Kraemer, *Humanism*, p. 59; Y. T. Langermann, "Saadya and the Sciences," in idem, *The Jews and the Sciences in the Middle Ages* (Brookfield, VT: Variorum, 1999), p. 13 n. 37.

[5] See S. Stroumsa, *Dāwūd ibn Marwān al-Muqammiṣ's Twenty Chapters* (Leiden: Brill, 1989).

[6] See the report by al-Qirqisānī, trans. L. Nemoy, *Karaite Anthology* (New Haven: Yale University Press, 1952), p. 54: "Dāwūd ibn Marwān al-Raqqī, known as al-Muqammis, has written a fine book containing a commentary on Genesis, which he translated from the commentaries of the Syrians." See also the discussion by S. Stroumsa, "What is Man: Psalm 8:4–5 in Jewish, Christian, and Muslim Exegesis in Arabic," *Henoch* 14 (1992): 283–91.

[7] In light of this, it is worth suggesting the possibility that Philo of Alexandria, the great Jewish Hellenistic philosophical exegete of Late Antiquity, might have influenced medieval Jewish exegetes indirectly through Syriac Christianity. For some investigation in this direction, see D. Runia, *Philo in Early Christian Literature: A Survey* (Minneapolis: Fortress Press, 1993), p. 16; B. Chiesa, "Dawud al-Muqammis e la sua opera," *Henoch* 18 (1996): 131–7 .

In the 100 years after Dāwūd, two related, but hostile and adversarial, traditions emerged. The Karaites, a Jewish sect that rejected the rabbinic tradition, developed a strongly grammatical approach to Scripture. Although some of the Karaite exegetes were opposed to philosophy, others embraced it and cultivated a rationalistic hermeneutic.[8] For example, Jacob al-Qirqisānī (tenth century) defended the use of reason in the introduction to his commentary on Genesis and made use of scientific and philosophical ideas in his explication of individual verses.[9] His defense of reason in the preface to the Genesis commentary reads as follows:

Before beginning this we must prove the validity of rational speculation and philosophical postulates from Scripture by mentioning some passages in it which point and lead to them. We shall do this because some of our scholars, upon hearing an interpretation interspersed with matters pertaining to philosophical speculation, are frightened away from it, regarding it as superfluous and unnecessary; indeed, some of them consider it improper and even forbidden. But this is only because of their ignorance and the poverty of their knowledge. Were the eyes of their mind open, they would have learned that these things are tools for the understanding of Scripture and ladders and bridges toward the perception of revealed truth, inasmuch as the truth of Scripture and religion can be comprehended only by reason. Since the philosophical postulates, too, are built upon rational deductions based in their turn upon the knowledge of things perceived by the human senses and logical axioms, he who rejects rational and philosophical opinions thereby denies all data posited by cogitation or sense perception.[10]

The Rabbanites, the heirs of the rabbinic tradition and defenders of midrash, also embraced the new traditions and methods,[11] mainly due to the efforts of Saadia Gaon (882–942). Saadia hailed from Egypt, but moved to Iraq where he ascended to the position of Gaon in the ancient rabbinic academy of Sura.[12] Writing in Arabic rather than Aramaic or Hebrew, and borrowing and adapting the philosophical and literary trends of his time, he managed to completely transform the literary character of Rabbinic Judaism.[13]

[8] For Karaite exegesis, both grammatical and philosophical/theological, see especially D. Frank, *Search Scripture Well: Karaite Exegetes and the Origins of the Jewish Bible Commentary in the Islamic East* (Leiden: Brill, 2004); and see, in general, *Karaite Judaism: A Guide to its History and Literary Sources*, ed. M. Polliack (Leiden: Brill, 2003), especially the chapters by H. Ben-Shammai, "Major Trends in Karaite Philosophy and Polemics in the Tenth and Eleventh Centuries," pp. 339–62, and M. Polliack, "Major Trends in Karaite Biblical Exegesis in the Tenth and Eleventh Centuries," pp. 363–413. Note that with the opening of the Firkovich collections in St. Petersburg, a team of scholars has been organized, primarily in Israel, to edit and translate Karaite commentaries and theological works. The first fruits are two manuscript catalogues: *Judaeo-Arabic Manuscripts in the Firkovich Collections: The Works of Yusuf al-Basir – A Sample Catalogue, Texts and Studies*, ed. D. Sklare, with H. Ben-Shammai (Jerusalem: Ben Zvi Institute, 1997) (Heb.); *Judaeo-Arabic Manuscripts in the Firkovich Collections: Yefet ben ʿEli al-Basri, Commentary on Genesis – A Sample Catalogue, Texts and Studies*, ed. H. Ben-Shammai, S. Butbul, S. Stroumsa, and D. Sklare (Jerusalem: Ben Zvi Institute, 2000) (Heb.).

[9] For examples, see Nemoy, *Karaite Anthology*, pp. 53–68; H. Ben-Shammai, "The Doctrines of Religious Thought of Abū Yūsuf Yaʿaqūb al-Qirqisānī and Yefet b. ʿEli," Ph.D. dissertation, Hebrew University of Jerusalem, 1977 (Heb.); idem, "Studies in Karaite Atomism," *Jerusalem Studies in Arabic and Islam* 6 (1985): 243–98.

[10] Nemoy, *Karaite Anthology*, pp. 54–5.

[11] For background on the Rabbanites, see in general R. Brody, *The Geonim of Babylonia and the Shaping of Medieval Jewish Culture* (New Haven: Yale University Press, 1988); idem, "The Geonim of Babylonia as Biblical Exegetes," in M. Saebo, ed., *Hebrew Bible/Old Testament: The History of Its Interpretation*, Vol. 1, Part 2, *The Middle Ages* (Göttingen: Vandenhoeck & Ruprecht, 2000), pp. 74–88.

[12] There is a considerable literature on Saadia. The foundational biography by H. Malter, *Saadia Gaon: His Life and Works* (Philadelphia: Jewish Publication Society, 1921), remains extremely useful. See also, in addition to the recent studies by Brody cited in the previous note, his *Rav Seʿadyah Gaʾon* (Jerusalem: Merkaz Zalman Shazar, 2006) (Heb.).

[13] For the literary developments, see especially R. Drory, *The Emergence of Jewish-Arabic Literary Contacts at the Beginning of the Tenth Century* (Tel Aviv: Tel Aviv University, 1988) (Heb.); idem, *Models and Contacts: Arabic Literature and its Impact on Medieval Jewish Culture* (Leiden: Brill, 2000).

Saadia was a zealous defender of Judaism and the rabbinic tradition. Much of his tumultuous career was devoted to polemics. He wrote controversial treatises against freethinking critics of the Bible and against the Karaites and included attacks on Christianity in his philosophical work and commentaries on the Bible. Yet his defense of tradition is far from traditional; on the contrary, his work is very innovative. He borrowed the methods of his rivals in order to develop a defensible rabbinic tradition.

Saadia's commentaries are long and digressive.[14] They include systematic introductions, Arabic translation of each verse, and extensive commentary. In his interpretations of verses and stories Saadia touches on subjects in every area of learning, from the philological and poetic, to the legal and polemical, to the philosophical, theological, and scientific.[15] He justifies the use of reason with his famous exegetical rule: If a verse contradicts reason, sense experience, another verse, or tradition, then it needs to be interpreted nonliterally. The first part of this rule, as it appears in his *Book of Beliefs and Opinions*, reads as follows:

> And so I declare, first of all, that it is a well-known fact that every statement found in the Bible is to be understood in its literal sense, except for those that cannot be so construed for one of the following four reasons: It may, for example, either be rejected by the observation of the senses, such as the statement: "And the man called his wife's name Eve; because she was the mother of all living" [Gen 3:20], whereas we see that the ox and the lion are not the offspring of womankind. Hence we must conclude that the implication of the statement embraces human descendants only. Or else the literal sense may be negated by reason, such as that of the statement: "For the Lord thy God is a devouring fire, a jealous God" [Deut 4:24]. Now fire is something created and defective, for it is subject to extinction. Hence it is logically inadmissible that God resemble it. We must, therefore, impute to this statement the meaning that God's punishment is like a consuming fire, in accordance with the remark made elsewhere in Scripture: "For all the earth shall be devoured with the fire of My jealousy" [Zeph 3:8].[16]

Like the Muʿtazilites, Saadia was concerned primarily with biblical anthropomorphisms. Yet the implication for philosophy and science in general is far-reaching, for sense experience and reason are made the final arbiters of scriptural meaning.

Saadia had extraordinary influence on the later rabbinic exegetical tradition. In the Islamic East, his imprint is found in the work of Samuel ben Hofni and others.[17] His writings

[14] All his extant commentaries have been edited and translated into Hebrew. See *Saadya's Commentary on Genesis*, ed. and trans. M. Zucker (New York: Jewish Theological Seminary of America, 1984); *Saadia's Commentary on Psalms*, ed. and trans. Y. Qafih (Jerusalem: Qeren ha-Rav Yehudah Leyb ṿe-ishto Menuḥah Ḥanah Epshṭain she-ʿal yad ha-Aqademyah ha-Ameriḳanit le-madaʿe ha-Yahadut, 1966); *Saadia's Commentary on Job*, ed. and trans. Y. Qafih (Jerusalem: Ha-Vaʿad le-Hotsaʾat Sifre Rasag, 1973); *Saadia's Commentary on Proverbs*, ed. and trans. Y. Qafih (Jerusalem: Ha-Vaʿad le-Hotsaʾat Sifre Rasag, 1975); *Saadia's Commentary on Daniel*, ed. and trans. Y. Qafih (Jerusalem: Ha-Vaʿad le-Hotsaʾat Sifre Rasag, 1981); *Rav Saadya's Commentary on Exodus*, collected, ed. and trans. Y. Ratzaby (Jerusalem: Mosad ha-Rav Kook, 1998); *Rav Saadya's Commentary on Isaiah*, collected, ed. and trans. Y. Ratzaby (Qiryat Ono: Mekhon Mishnat ha-Rambam, 1994); Y. Ratzaby, "Excerpts from Rav Saadya's *Commentary on Lamentations*," *Bar-Ilan Annual* 20–1 (1983): 349–81 (Heb.). See also the English translations by M. Sokolow, "Saʿadya Gaon's Prologomenon to Psalms," *PAAJR* 51 (1984): 131–74; L. E. Goodman, *The Book of Theodicy: Translation and Commentary on the Book of Job by Saadiah Ben Joseph al-Fayyūmī* (New Haven: Yale University Press, 1998); H. Ben-Shammai, "Saadia's Introduction to Daniel: Prophetic Calculation of the End of Days vs. Astrological and Magical Speculation," *Aleph* 4 (2004): 11–87.

[15] For examples, see G. Freudenthal, "Stoic Physics in the Writings of Rabbi Saʿadia Ga'on al-Fayyūmī and Its Aftermath in Medieval Jewish Mysticism," *Arabic Sciences and Philosophy* 6 (1996): 113–36; Langermann, "Saadya and the Sciences"; idem, "A Citation from Saadia's Long Commentary to Genesis, in Hebrew Translation," *Aleph* 4 (2004): 293–7.

[16] Saadia Gaon, *The Book of Beliefs and Opinions*, trans. S. Rosenblatt (New Haven: Yale University Press, 1948), pp. 265–6.

[17] See A. Greenbaum, *The Biblical Commentary of Rav Samuel b. Hofni Gaon* (Jerusalem: Mosad ha-Rav Kook, 1978); D. Sklare, *Samuel ben Hofni Gaon and His Cultural World* (Leiden: Brill, 1996).

spread west as well, to North Africa and Islamic Spain, where they were read, used, and surpassed by a new generation of philosophers, exegetes, and philosopher-exegetes.

ISLAMIC SPAIN

The second major development in the history of medieval Jewish philosophical exegesis took place in Islamic Spain. There, during the tenth and especially eleventh and twelfth centuries, a very diverse Judeo-Arabic culture emerged. It included original contributions in legal scholarship, grammar, poetry, philosophy, theology, and biblical commentary.

The Spanish school of biblical exegesis was primarily concerned with grammar, rhetoric, and history; its members developed what is now called the Spanish school of *peshat*.[18] Yet they were interested in philosophy and philosophical exegesis as well. Thus Solomon Ibn Gabirol wrote Neoplatonic explications of the Garden of Eden and of Jacob's ladder; Moses Ibn Ezra devoted part of his *Maqālat al-Ḥadīqa fi maʿnā al-majāz wa-ʾl-ḥaqīqa* (Treatise of the Garden on Figurative and Literal Language) to the philosophical discussion of biblical words and stories, and exegesis is found throughout the philosophical-theological writings of figures such as Bahya Ibn Paqudah and Judah Halevi.[19] Even the grammarians and grammarian-exegetes per se, such as Judah Ibn Balʿam and Moses Ibn Giqatilla, were not averse to introducing philosophical or scientific ideas into their biblical commentaries.[20] Yet there were two exegetes in particular – Isaac Ibn Ghiyath (1038–89) and Abraham Ibn Ezra (1089–1164) – who embraced both *peshat* and philosophy. These two figures are the focus here.

Isaac Ibn Ghiyath was a scholar of varied talents; indeed, he is a perfect example of the diverse Jewish culture of Islamic Spain. Legal authority, poet, and biblical exegete, he introduced scientific and philosophical themes, mainly of a Neoplatonic orientation, into his poetry and exegesis. His only commentary is a long Judeo-Arabic explication of Ecclesiastes, which (like Saadia's commentaries) includes a systematic preface, an Arabic translation of each verse, and a verse-by-verse interpretation of the text.[21] The commentary includes detailed grammatical and rhetorical explications, as well as philosophical interpretations and digressions. According to Ibn Ghiyath, the use of philosophy is necessary because Solomon himself was a master of all the sciences and subtly alluded to every discipline in his work. As enumerated in Ibn Ghiyath's preface, the expertise shown by Solomon in Ecclesiastes

[18] For the development of Spanish *peshat*, see especially the work of Uriel Simon, of which a bibliography is available in *Studies in Bible and Exegesis* 5 (Ramat Gan: Bar-Ilan University Press, 2000), pp. 21–9 (Heb.).

[19] For a survey of these developments, see S. Klein-Braslavy, "The Philosophical Exegesis," in *Hebrew Bible/Old Testament: The History of Its Interpretation*, Vol. 1, Part 2, pp. 302–20; M. Cohen, "The Aesthetic Exegesis of Moses Ibn Ezra," ibid., pp. 282–301; and P. Fenton, *Philosophie et exégèse dans le jardin de la métaphore de Moïse Ibn Ezra, philosophe et poète andalou du XIIe siècle* (Leiden: Brill, 1997).

[20] See, e.g., the editions and Hebrew translations by M. Perez: *Rabbi Judah Ibn Balʿam's Commentary on Isaiah* (Ramat Gan: Bar-Ilan University Press, 1992); *Rabbi Judah Ibn Balʿam's Commentary on Ezekiel* (Ramat Gan: Bar-Ilan University Press, 2000); *Rabbi Judah Ibn Balʿam's Commentary on Jeremiah* (Ramat Gan: Bar-Ilan University Press, 2002).

[21] The commentary was edited and translated by Y. Qafih, in *Hameš megillot* (Jerusalem: ha-Agudah le-hatsalat ginze Teman, 1962), pp. 157–296. For proof of Ibn Ghiyath's authorship, see S. Poznanski, "Aus Abu-l-Barakat Hibat-Allahs arabischen Kommentar zu Kohelet," *Zeitschrift für Hebraeische Bibliographie* 16 (1913): 32–6; S. Pines, "Toward the Study of Abû al-Barakât al-Baghdâdî's *Commentary on Ecclesiastes*: Four Texts," *Tarbiz* 33 (1964): 198–213 (Heb.); Sh. Abramson, "Toward a Study of Isaac Ibn Ghiyath's *Commentary on Ecclesiastes*," *Qiryat Sefer* 52 (1977): 156–72 (Heb.); H. Mittelman, "A Commentary on Ecclesiastes in Judeo-Arabic Ascribed to Isaac Ibn Ghiyath," Ph.D. dissertation, Hebrew University, 1999 (Heb.); idem, "Asceticism in the Commentary on Ecclesiastes Attributed to Ibn Ghiyath, with Comparison to Islamic Mysticism," *Daʿat* 48 (2002): 57–80 (Heb.).

includes arithmetic, geometry, astronomy, natural science, music, medicine, logic, grammar, rhetoric, poetics, and metaphysics.[22]

Perhaps the most important, and certainly the most influential, exegete of the Andalusian tradition was Abraham Ibn Ezra. Although he wrote in Hebrew rather than Arabic and completed his works outside of Islamic Spain, his writings represent the final flowering of Spanish *peshat*.

Ibn Ezra was a prolific author. He composed poetry; works of grammar and philosophy; introductions to mathematics, astronomy, and astrology; and biblical commentaries, often producing two versions of the same text. His extant biblical commentaries include explications of the Pentateuch, Isaiah, the twelve Minor Prophets, Psalms, Job, the Five Scrolls, and Daniel. Most of these commentaries include philosophical and scientific digressions. His main interest is in mathematics, astronomy, and astrology, but he touches on other subjects as well, especially Neoplatonic philosophy.[23]

The most famous excursus in Ibn Ezra's commentaries is in his long commentary on Exodus. After a brief explication of Exod. 33:20–1 ("And He said, Thou canst not see my face: for there shall no man see me, and live; And the Lord said, Behold, there is a place by me, and thou shalt stand upon a rock"), he proceeds with a detailed explanation of the names of God and the knowledge of God, in light of arithmetic and arithmology; he then presents a lengthy introduction to astrology and astronomy, including discussion of the 12 constellations, 7 planets, 48 forms, 120 conjunctions, and 7 climes and of the relationship between celestial movements and the four elements. He ends his excursus with an attempted resolution to the problem of astral determinism – that human beings can overcome celestial causation through prophecy.[24] This he supports with a parable, perhaps borrowed from *Ikhwān al-Ṣafā'*,[25] and concludes as follows:

Imagine the following: The seven moving stars are like horses that run along a path. They do not run with the intention of doing good or bad. They act in accordance with their nature. Now imagine that a blind man is in their path. The blind man does not know how the horses act. He does not know

[22] See *Hameš megillot*, p. 168. For examples of science in the commentary, see G. Vajda, "Quelques observations en marge du commentaire d'Isaac Ibn Ghiyāth sur l'Ecclésiastes," *Seventy-Fifth Anniversary Volume of the Jewish Quarterly Review* (Philadelphia, 1967), pp. 518–27; idem, "Ecclésiastes XII, 2–7 interprété par un auteur juif d'Andalousie du XI^{e} siècle," *Journal of Semitic Studies* 27 (1982): 33–46.

[23] For mathematics, astronomy, and astrology in his commentaries, see Y. T. Langermann, "Some Astrological Themes in the Thought of Abraham Ibn Ezra," in I. Twersky and J. Harris, eds., *Rabbi Abraham Ibn Ezra: Studies in the Writings of a Twelfth-Century Jewish Polymath* (Cambridge, MA: Harvard University Press, 1993), pp. 28–85; D. Schwartz, *Astrology and Magic in Medieval Jewish Thought* (Ramat Gan: Bar-Ilan University Press, 1999) (Heb.); idem, *Studies in Astral Magic in Medieval Jewish Thought* (Leiden: Brill, 2005); S. Sela, *Astrology and Exegesis in the Thought of Abraham Ibn Ezra* (Ramat Gan: Bar-Ilan University Press, 1999) (Heb.); idem, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003); M. Gómez-Aranda, "Ecl 12,1–7 interpretado por Abraham Ibn Ezra," *Sefarad* 52 (1992): 113–21; idem, ed. and trans., *El Comentario de Abraham Ibn Ezra al Libro del Eclesiastés* (Madrid: Instituto de Filología del CSIC, Departamento de Filología Bíblica y de Oriente Antiguo, 1994); idem, "Teorías astronómicas y astrológicas en el Comentario de Abraham Ibn Ezra al Libro del Eclesiastés," *Sefarad* 55 (1995): 257–72; idem, "Aspectos científicos en el comentario de Abraham Ibn Ezra al Libro de Job," *Henoch* 23 (2001): 81–96. Most recently, Josefina Rodríguez Arribas ("La Astrología en la Exégesis de Abraham Ibn Ezra," Ph.D. dissertation, Universidad Complutense de Madrid, 2004), has singled out all or most of the astrological digressions, translated them into Spanish, and provided brief commentary. I thank her for sending me a copy of her dissertation. For Ibn Ezra's philosophy more generally, see J. Cohen, *The Philosophical Thought of Ibn Ezra* (Rishon le-Zion: Shai, 1996) (Heb.).

[24] This excursus has been discussed most fully by Sela, *Astrology and Exegesis*, Part 1. For the discussion of astral determinism, see also C. H. Manekin, "Freedom within Reason? Gersonides on Human Choice," in C. H. Manekin, ed., *Freedom and Moral Responsibility*, (College Park: University Press of Maryland, 1997), pp. 165–204, especially the appendix.

[25] For this suggestion, see Langermann, "Some Astrological Themes," p. 80 n. 67.

when they go to the right and when they go to the left. The blind man depends on a person with sight who knows the way the horses run. Now the person with sight will guard the blind man. When the horses run to one side he will lead the blind person to the other side. The course of the horse's running does not change but the blind man is saved. It is because of this that Scripture states: "The sun and the moon and the stars even all the host of heaven which the Lord thy God has allotted unto all the peoples under the whole heaven" [Deut 4:19]. . . . This is what the Rabbis mean by "Israel has no constellation" as long as they keep the Torah. If Israel does not keep the Torah, then the star rules over them, as has been proven, for any conjunction combined with Aquarius is an evil arrangement. It results in harm befalling Israel. This is admitted by the astrologers.[26]

Ibn Ezra's commentaries were read widely in Christian Europe, where Hebrew rather than Arabic was the language of Jewish culture. In many cases, Jews in Europe had their first taste of the sciences through his commentaries on the Bible. Beginning in the thirteenth century and continuing into the fourteenth and fifteenth centuries, a supercommentary tradition developed as well. The supercommentators generally focused on the philosophical and scientific exegesis. They provided relevant scientific background and explanation in their efforts to decode Ibn Ezra's unstated "secrets."[27]

MAIMONIDES AND MAIMONIDEANISM

A turning point in the history of exegesis, as in so many other areas, came with the work of Moses Maimonides, the last major Jewish scholar from Andalusia. Maimonides was born in Cordoba in 1138, fled the Muwahhid persecutions in 1148, and settled in Egypt, where he died in 1204.

Although Maimonides did not write a proper biblical commentary, his *Guide of the Perplexed* is largely concerned with exegesis. It presents a well-developed theory of philosophical interpretation, sets forth an allegorical lexicon, and gives model explications of key biblical texts. These texts include the story of Jacob's ladder (Genesis 28), Moses' request for knowledge of God (Exodus 33), the story of creation and the Garden of Eden (Genesis 1–5), the chariot visions (Isaiah 6; Ezekiel 1 and 10), the Book of Job, the binding of Isaac (Genesis 22), and Jeremiah 9:22–3, which he explains in relation to philosophical debates about the final aim of human existence, whether active or contemplative. He also singles out and discusses other verses and stories in relation to miracles, prophecy, divine providence, and the problem of evil.[28]

[26] Abraham Ibn Ezra, *Ibn Ezra's Commentary on the Pentateuch,* trans. and annot. H. Norman Strickman and A. M. Silver, Vol. 2, Exodus (New York: Menorah, 1996), p. 702 (Long Commentary on Exod. 33:21).

[27] For the supercommentaries, see U. Simon, "Interpreting the Interpreter: Supercommentaries on Ibn Ezra's Commentaries," in *Rabbi Abraham Ibn Ezra*, pp. 86–128; D. Schwartz, *Old Wine in New Bottles: The Philosophy of a Fourteenth-Century Jewish Neoplatonic Circle* (Jerusalem: Mosad Bialik, 1996) (Heb.); idem, "On the Philosophical Interpretation of Abraham Ibn Ezra's Commentaries," *Alei Sefer* 18 (1996): 114–71 (Heb.); idem, *Astrology and Magic in Medieval Jewish Thought*; idem, *Amulets, Properties, and Rationalism in Medieval Jewish Thought* (Ramat Gan: Bar-Ilan University Press, 2004), pp. 67–93 (Heb.); idem, *Studies in Astral Magic*; T. Visi, "The Early Ibn Ezra Supercommentaries: A Chapter in Medieval Jewish Intellectual History," Ph.D. dissertation, Central European University, Budapest, 2006.

[28] There is a large scholarship on Maimonides as exegete. See especially S. Klein-Braslavy, *Maimonides' Interpretation of the Stories about Adam/Man in Genesis* (Jerusalem: Rubin Mass, 1987) (Heb.); idem, *Maimonides' Interpretation of the Story about the Creation of the World* (Jerusalem: Rubin Mass, 1988) (Heb.); idem, "Maimonides' Interpretations of Jacob's Dream about the Ladder," *Bar-Ilan Year Book* 22–3 (1988), 329–49 (Heb.); idem, "Maimonides' Commentaries to Proverbs 1:6," in M. Hallamish, ed., *ʿAlei Shefer,* (Ramat Gan: Bar-Ilan University Press, 1990), pp. 121–32 (Heb.); idem, *King Solomon and Philosophical Esotericism in the Thought of Maimonides* (Jerusalem: Magnes Press, 1996) (Heb.). For earlier research, see J. Dienstag, "Biblical Exegesis of Maimonides in Jewish Scholarship," in G. Appel, ed., *S. K. Mirsky Memorial Volume* (New York: Yeshiva University, 1970), pp. 151–90; idem, "Bibliography of Maimonides as Exegete," in B. Z. Luria, ed., *Sefer Ḥayyim Gevaryahu: Meḥqarim ba-miqraʾ*

Maimonides identified problematic texts but did not explain them in detail. In addition, although he introduced a method of interpretation, he did not apply it to the Bible as a whole. Instead, he left this task to his followers in Provence and Italy, who devoted themselves to finishing what the master had begun. His impact is felt throughout the exegetical developments in Christian Spain and the later Islamic East as well. Each of these four areas – Provence, Italy, Christian Spain, and the Islamic East – are surveyed here.

The Provençal Tradition

The history of Jewish philosophy and philosophical exegesis in southern France (called "Provence" in Jewish sources) is especially interesting. Over the course of 150 years, from around 1150 to 1306, this ancient center of talmudic and midrashic learning was transformed into the most active center of Jewish philosophy of the time. Supported by the patronage of local scholars and helped by the arrival of refugees from Islamic Spain, Judeo-Arabic and Arabic works were translated into Hebrew and served as the basis for encyclopedias, philosophical summas, and scientific and philosophical explications of the Bible and rabbinic literature.[29]

The first major philosopher-exegete in southern France was Samuel Ibn Tibbon (ca. 1165–1232), the translator of the *Guide of the Perplexed* into Hebrew. Building on Maimonides, Ibn Tibbon wrote a commentary on Ecclesiastes, in which he discussed several philosophical and scientific ideas. He also wrote a philosophical-exegetical treatise entitled *Maʾamar Yiqqawu ha-mayim* (Treatise on "Let the Waters be Gathered" [Gen. 1:9]) and planned two additional commentaries: one on the internal meanings of Proverbs and an esoteric explanation of Genesis, entitled *Ner ha-Hofeś* (A Candle for Him Who Searches; cf. Prov. 20:27).[30]

u-ve-maḥševet yisraʾel, muggaš lo be-haggiʿo le-śevah, ed. (Jerusalem: ha-Ḥevrah le-ḥeḳer ha-Miḳra be-Yiśra'el, 1988–91), pp. 346–66. See also: L. V. Berman, "Maimonides on the Fall of Man," *AJS Review* 5 (1980): 1–15; W. Z. Harvey, "Maimonides' Interpretation of Genesis 3:22," *Daʿat* 12 (1984): 15–21 (Heb.); idem, "Maimonides and Aquinas on Interpreting the Bible," *Proceedings of the American Academy for Jewish Research* 55 (1988): 59–77; idem, "Maimonides on Job 14:20 and the Story of the Garden of Eden," in S. Nash, ed., *Bein historiyah la-sifrut, Festschrift for Isaac Barzilay* (Tel Aviv: ha-Kibbuts ha-Me'uḥad, 1997) (Heb.), pp. 143–8; idem, "On Maimonides' Allegorical Readings of Scripture," in J. Whitman, ed., *Interpretation and Allegory: Antiquity to the Modern Period* (Leiden: Brill, 2000), pp. 181–8; S. Rosenberg, "Notes on Biblical and Aggadic Exegesis in *The Guide of the Perplexed*," in S. Pines, ed., *Yaʿaqov Friedman Memorial Volume* (Jerusalem: Hebrew University Institute for Jewish Studies, 1974) (Heb.), pp. 215–21; idem, "On Biblical Exegesis in the *Guide of the Perplexed*," *Jerusalem Studies in Jewish Thought* 1 (1981): 85–175 (Heb.); idem, "Philosophical Exegesis of Song of Songs: Introductory Remarks," *Tarbiz* 59 (1990): 133–51 (Heb.). And see the recent summary statements by S. Klein-Braslavy, "The Philosophical Exegesis"; idem, "Bible Commentary," in K. Seeskin, ed., *The Cambridge Companion to Maimonides* (Cambridge: Cambridge University Press, 2005), pp. 245–72; G. Freudenthal, "Maimonides' Philosophy of Science," ibid., pp. 134–66, on pp. 156–9.

29 On this transformation, see especially I. Twersky, "Aspects of the Social and Cultural History of Provençal Jewry," *Journal of World History* 11 (1968): 185–207; repr. in H. H. Ben-Sasson and S. Ettinger, eds., *Jewish Society through the Ages* (New York: Schocken Books, 1971). For the translations, see G. Freudenthal, "Les sciences dans les communautés juives médiévales de Provence: Leur appropriation, leur rôle," *REJ* 152 (1993): 29–136; idem, "Science in the Medieval Jewish Culture of Southern France," *History of Science* 33 (1995): 23–58; M. Zonta, *La filosofia antica nel Medioevo ebraico: La traduzioni ebraiche medievali dei testi filosofici antichi* (Brescia: Paideia, 1996); J. Robinson, "The Ibn Tibbon Family: A Dynasty of Translators in Medieval Provence," in J. Harris, ed., *Beʾerot Yitzhak: Studies in Memory of Isadore Twersky* (Cambridge, MA: Harvard University Press, 2005), pp. 193–224.

30 For Ibn Tibbon's life, philosophy, and exegesis, see A. Altmann, "The Ladder of Ascension," in E. E. Urbach, R. J. Z. Werblowsky, and Ch. Wirszubsky, eds., *Studies in Mysticism and Religion Presented to Gershom G. Scholem on His Seventieth Birthday* (Jerusalem: Magnes Press, 1967), pp. 1–32; R. Ben-Meir, "Samuel Ibn Tibbon's Preface to the Commentary on Ecclesiastes," *Maimonidean Studies* 4 (2000): 13–44 (Heb. section); R. Eisen, *The Book of Job in Medieval Jewish Philosophy* (Oxford: Oxford University Press, 2004), pp. 79–110; C. Fraenkel, *From Maimonides to Samuel Ibn Tibbon: The Transformation of the Dalālat al-Ḥāʾirīn into the Moreh ha-Nevuḵim* (Jerusalem: Magnes Press,

In what way was Ibn Tibbon's exegesis Maimonidean? The best example is his interpretation of verses from Genesis 1. Following Maimonides' hint in *Guide* 2.30 – that Aristotle's *Meteorology* is the key to understanding the "Account of the Beginning" – Ibn Tibbon translated that work into Hebrew and used it in his interpretation of Genesis.[31] He also used it in the explanation of several additional biblical texts, especially Psalm 104 and (as is seen later) verses from Ecclesiastes.

Here are several other examples of philosophy and science in Ibn Tibbon's commentaries.[32] He explains Ecclesiastes 1:3 and the locutions "under the sun" and "under the heavens" in terms of meteorological theories about light and reflection. The phrase, "a generation comes and a generation goes" (Ecc. 1:4), he interprets in relation to the eternity of matter. He explains the going and coming of the sun (Ecc. 1:5–6) in light of the rival astronomical models of Ptolemy and al-Biṭrūjī. The sea that never fills (Ecc. 1:7) is expounded through a meteorological discussion of rivers and evaporation. He interprets the pairs of "times" (Ecc. 3:1–8) – as Ibn Tibbon calls them – in terms of the Aristotelian notion of time, motion, and celestial influence on generation and corruption. He discusses "man has no preeminence above the beast" (Ecc. 3:19) in light of Aristotelian embryology, citing and explaining Aristotle's rule that "man comes from man and the sun." He understands the image of the crackling thorns under a pot (Ecc. 7:6) in relation to thunder and lightning. Finally, in his explication of Ecclesiastes 7:10 and the asking of improper questions, he discusses the unusual properties of limestone, which can be heated by cold water. Ibn

2007) (Heb.); G. Freudenthal, "(Al-)Chemical Foundations for Cosmological Ideas: Ibn Sīnā on the Geology of an Eternal World," in S. Unguru, ed., *Physics, Cosmology, and Astronomy, 1300–1700: Tension and Accommodation* (Dordrecht: Kluwer Academic Publishers, 1991), pp. 47–73; J. Kugel, "Some Medieval and Renaissance Ideas about Biblical Poetry," in I. Twersky, ed., *Studies in Medieval Jewish History and Literature* (Cambridge, MA: Harvard University Press, 1979), pp. 57–81; A. Ravitzky, "The Thought of Rabbi Zeraḥyah b. Isaac b. She'altiel Ḥen and Maimonidean-Tibbonian Philosophy in the Thirteenth Century," Ph.D. dissertation, Hebrew University, 1978 (Heb.); idem, "Samuel Ibn Tibbon and the Esoteric Character of *The Guide of the Perplexed*," *AJS Review* 6 (1981): 87–123; idem, "The Secrets of the *Guide of the Perplexed*: Between the Thirteenth and the Twentieth Centuries," in I. Twersky, ed., *Studies in Maimonides* (Cambridge, MA: Harvard University Press, 1990), pp. 159–207; idem, "Aristotle's *Meteorology* and Maimonidean Exegesis of the Account of Creation" (Heb.), *Jerusalem Studies in Jewish Thought* 9 (1990): 225–50; idem, *ʿIyyunim maimoniyim* (Jerusalem: Schocken Books, 2006); J. Robinson, "Samuel Ibn Tibbon's *Commentary on Ecclesiastes* and the Philosopher's Prooemium," in I. Twersky and J. M. Harris, eds., *Studies in Medieval Jewish History and Literature*, Vol. 3 (Cambridge, MA: Harvard University Press, 2000), pp. 83–146; idem, "The First References in Hebrew to al-Biṭrūjī's *On the Principles of Astronomy*," *Aleph* 3 (2003): 145–63; idem, "The Ibn Tibbon Family"; idem, "From Digression to Compilation: Samuel Ibn Tibbon and Immanuel of Rome on Genesis 1:11, 1:14, 1:20," *Zutot* 4 (2006): 81–97; idem, "Maimonides, Samuel Ibn Tibbon, and the Construction of a Jewish Tradition of Philosophy," in J. Harris, ed., *Maimonides after 800 Years: Essays on Maimonides and His Influence* (Cambridge, MA: Harvard University Press, 2007), pp. 291–306; idem, *Samuel Ibn Tibbon's Commentary on Ecclesiastes, The Book of the Soul of Man* (Tübingen: Mohr Siebeck, 2007); idem, *Samuel Ibn Tibbon's Commentary on Ecclesiastes: Critical Edition of the Hebrew Text with Commentary and Introduction* (Jerusalem: World Union of Jewish Studies, forthcoming); idem, "Samuel Ibn Tibbon's *Peruš ha-Millot ha-Zarot* and al-Fārābī's *Eisagoge* and *Categories*," *Aleph* 9(1) (2009): 41–76; J. Sermoneta, "Samuel Ibn Tibbon's Critical Remarks on Maimonides' Theory of Intellects," *Proceedings of the Sixth World Congress of Jewish Studies* (Jerusalem, 1977), 3: 315–19 (Heb.); G. Vajda, "An Analysis of the *Ma'amar Yiqqawu ha-Mayim* by Samuel b. Judah Ibn Tibbon," *Journal of Jewish Studies* 10 (1959): 137–49.

[31] For an edition, translation, and general discussion, see R. Fontaine, *Otot ha-Shamayim: Samuel Ibn Tibbon's Hebrew Version of Aristotle's Meteorology* (Leiden: Brill, 1995); idem, "Samuel Ibn Tibbon's Translation of the Arabic Version of Aristotle's *Meteorology*," in G. Endress and R. Kruk, eds., *The Ancient Tradition in Christian and Islamic Hellenism* (Leiden: Brill, 1997), pp. 85–100; and see Fontaine's contribution to the present volume, Chapter 12. For the use of meteorology in exegesis, see A. Ravitzky, "Aristotle's *Meteorology* and the Maimonidean Modes of Interpreting the Account of Creation," *Aleph* 8 (2008): 361–400. For its influence on the later tradition, see Schwartz, *Old Wine*, esp. pp. 63–116. See also Y. T. Langermann, "'The Making of the Firmament': Rabbi Hayyim Israeli, Rabbi Isaac Israeli, and Maimonides," *Shlomo Pines Jubilee Volume*, Part 1: *Jerusalem Studies in Jewish Thought* 7 (1988), 461–6 (Heb.).

[32] For the examples listed, see Robinson, "The First References"; idem, *Ibn Tibbon's Commentary on Ecclesiastes.*

Tibbon also introduces considerable medical material into his commentary, although it is mostly philosophical and ethical rather than scientific; he focuses on standard themes of diet, exercise, and psychosomatic illness. Still he does present some interesting material in the commentary on Ecclesiastes 12:2–7. Drawing on the rabbis, Ibn Ghiyath, and Ibn Ezra, he adds some novel remarks about the different functions of veins and arteries.

Ibn Tibbon was the founder of a Maimonidean tradition of philosophical exegesis in Provence.[33] He was followed by his son Moses (fl. 1244–83), who wrote a philosophical explication of Song of Songs, as well as several short philosophical-exegetical monographs.[34] Moses' son-in-law Jacob Anaṭoli (ca. 1194–1256) produced a collection of sermons, *Malmad ha-talmidim* (A Goad for the Students), which contains dozens of philosophical explications of Psalms and Proverbs.[35] This tradition spread outside the family as well. For example, Samuel Ibn Tibbon's contemporary David Kimhi (ca. 1160–1235) wrote Maimonidean commentaries on Genesis 2:7–5:1 and Ezekiel 1 and used philosophical ideas in many of his commentaries.[36] Levi ben Abraham (ca. 1235–after 1305) wrote *Liwyat ḥen* (The Graceful Garland; cf. Prov. 1:9; 4:9), an encyclopedia of philosophy and religion, which includes several chapters devoted to philosophical exegesis.[37] Even Menaḥem ha-Meiri (1249–1315), the leading legal scholar of thirteenth- and early fourteenth-century Provence, was bitten by the Maimonidean bug. His commentaries on Psalms and Proverbs include philosophical and scientific explanations borrowed from Maimonides, Ibn Tibbon, and especially Anaṭoli.[38]

33 For this tradition, see especially Ravitzky, "Zeraḥyah b. Isaac b. Sheʾaltiel Ḥen." See also J. Robinson, "We Drink Only from the Master's Water: Maimonides and Maimonideanism in Southern France, 1204–1306," in Sh. Berger and I. Zwiep, eds., *Studia Rosenthaliana 40: Epigonism in Jewish Culture* (2007–8), pp. 27–60; idem, "Maimonides, Samuel Ibn Tibbon, and the Construction of a Jewish Tradition of Philosophy," in J. Harris, ed., *Maimonides after 800 Years: Essays on Maimonides and his Influence* (Cambridge: Harvard University Press, 2007), pp. 291–306.

34 See C. Sirat, "La pensée philosophique de Moïse Ibn Tibbon," *REJ* 138 (1979): 505–15; O. Fraisse, *Moses Ibn Tibbons Kommentar zum Hohenlied und sein poetologisch-philosophisches Programm* (Berlin: Walter de Gruyter, 2004).

35 On Anaṭoli, see in general M. L. Gordon, "The Rationalism of Jacob Anaṭoli," Ph.D. dissertation, Yeshiva University, 1974; A. Melamed, "Political Thought in Jacob Anaṭoli's *Malmad ha-talmidim*," *Daʿat* 20 (1988): 91–115 (Heb.); C. Sirat, "Les traducteurs juifs à la cour des rois de Sicile et de Naples," in G. Contamine, ed., *Traduction et traducteurs au moyen âge* (Paris: Editions du CNRS, 1989), pp. 169–91; M. Saperstein, "Christians and Christianity in the Sermons of Jacob Anaṭoli," *Jewish History* 6 (1992): 225–42; repr. in *Your Voice like a Ram's Horn: Themes and Texts in Traditional Jewish Preaching* (Cincinnati: HUC Press, 1996), pp. 55–74; J. Robinson, "Secondary Forms of Transmission: Teaching and Preaching Philosophy in Thirteenth-Century Provence," in H. Ben-Shammai, S. Shaked, and S. Stroumsa, eds., *Exchange and Transmission across Cultural Boundaries: Philosophy, Mysticism, and Science in the Mediterranean World* (forthcoming).

36 The allegorical commentary on Genesis was published as an appendix to *The Commentary of David Kimhi on Isaiah*, L. Finkelstein, ed. (New York: Columbia University Press, 1926), pp. liii–lxxiv. The allegorical commentary on Ezekiel is included as an appendix in *Miqraʾot Gedolot ha-Keter*. For philosophy and science in his commentaries, see F. Talmage, "David Kimhi and the Rationalist Tradition," *HUC Annual* 39 (1968): 177–218; idem, "David Kimhi and the Rationalist Tradition II: Literary Sources," in C. Berlin, ed., *Studies in Jewish Bibliography, History, and Literature in Honor of I. Edward Kiev* (Hoboken: Ktav, 1972), pp. 453–78. For his work in general, see: F. Talmage, *David Kimhi: The Man and the Commentaries* (Cambridge, MA: Harvard University Press, 1975); M. Cohen, "The Qimhi Family," in *Hebrew Bible/Old Testament*, Vol. 1, Part 2, pp. 388–415; idem, *Three Approaches to Biblical Metaphor: From Abraham Ibn Ezra and Maimonides to David Kimhi* (Leiden: Brill, 2003).

37 See H. Kreisel, *Levi b. Abraham b. Ḥayyim, Liwyat Ḥen 6:3, Maʿaśeh bereʾšit* (Jerusalem: World Union of Jewish Studies, 2004); idem, *Levi ben Avraham's Livyat Ḥen: The Quality of Prophecy and the Secrets of the Torah* (Beer Sheva: Ben-Gurion University of the Negev, 2007) (Heb.). For a general survey of the work, see W. Z. Harvey, "Levi ben Abraham of Villefranche's Controversial Encyclopedia," in S. Harvey, ed., *The Medieval Hebrew Encyclopedias of Science and Philosophy* (Dordrecht: Kluwer Academic Publishers, 2000), pp. 171–190.

38 For background on Menaḥem ha-Meiri, see G. Stern, "Menaḥem ha-Me'iri and the Second Controversy over Philosophy," Ph.D. dissertation, Harvard University, 1995; M. Halbertal, *Between Torah and Wisdom: Menaḥem ha-Me'iri and the Maimonidean Halakhists in Provence* (Jerusalem: Magnes Press, 2000) (Heb.). For his exegesis and influence of Anaṭoli on it, see Robinson, "Secondary Forms of Transmission."

One example can illustrate the way these writings respond to and build on one another. In the first sermon of *Malmad ha-talmidim*, Anaṭoli presents a full verse-by-verse explication of Proverbs 30. Borrowing ideas from *Guide* 1.31–4 and 2.30, he explains the chapter in Proverbs as a commentary on the account of creation in Genesis 1. Following Anaṭoli's lead, Levi devotes one chapter to Proverbs 30 in his explication of the "Account of the Beginning" in *Liwyat ḥen* (Part 2, 6.3.9), whereas ha-Meiri incorporates passages from both Anaṭoli and Levi in his verse-by-verse explication of Proverbs 30 in his commentary on that book.

Provence in the Fourteenth and Fifteenth Centuries

The most creative period of philosophical exegesis in Provence was the thirteenth century, but the tradition continued into the fourteenth as well. Thus Gersonides (1288–1344), the most original Jewish philosopher of the later Middle Ages, wrote commentaries on several biblical books, including the Pentateuch, Joshua, Judges, Kings, Isaiah, Job, Proverbs, the Five Scrolls, Daniel, Ezra-Nehemiah, and Chronicles. In these commentaries, Gersonides borrows from Maimonides and others, but starts to move in new directions as well. Thus he incorporates into them many of his own novel ideas from the *Wars of the Lord* and develops a new style of presentation, dividing his commentaries into exegetical, grammatical, and philosophical insights.[39]

One example of this interface between the commentaries and the *Wars* is his explanation of Genesis 1.[40] According to Gersonides, the "Account of the Beginning" in Genesis 1 represents the creation of the upper world and the lower world, but not from nothing. Rather, everything, in both the celestial and sublunar realms, derives from a preexistent something, what he calls a "body with no form" or a "body that does not retain its shape." The original state of chaos, of *tohu* and *bohu*, refers to this antemundane unformed stuff, whereas the verses that follow describe the causal relation of all things that come into existence from it: "Light" refers to the celestial intelligences, the "firmament" to the celestial bodies, the water above and below the firmament to celestial and sublunar matter, and so on. The question is, What is this preexistent stuff? Is it the Platonic receptacle? Aristotelian

[39] A full bibliography on Gersonides is now available: M. Kellner, "Bibliographia Gersonideana: An Annotated List of Writings by and about R. Levi ben Gershom," in G. Freudenthal, ed., *Studies on Gersonides* (Leiden: Brill, 1992), pp. 367–414; updated in *Aleph* 3 (2003): 345–74. For his exegesis, of special note are the two commentaries translated into English – A. Lassen, *The Commentary of Levi ben Gerson (Gersonides) on the Book of Job* (New York: Bloch, 1946) and M. Kellner, *The Commentary on Song of Songs by Levi ben Gershom (Gersonides)* (New Haven: Yale University Press, 1998) – and the following studies: S. Feldman, "Gersonides and Biblical Exegesis," appendix to *The Wars of the Lord*, trans. S. Feldman, Vol. 2 (Philadelphia, PA: Jewish Publication Society, 1987), pp. 213–47; M. Kellner, "Maimonides and Gersonides on Astronomy and Metaphysics," in F. Rosner and S. Kottek, eds., *Moses Maimonides: Physician, Scientist, and Philosopher* (Northvale, NJ: Jason Aronson, 1993), pp. 91–9; idem, "Gersonides on the Song of Songs and the Nature of Science," *Journal of Jewish Thought and Philosophy* 4 (1994): 1–21; idem, "Gersonides on the Role of the Active Intellect in Human Cognition," *HUC Annual* 65 (1994): 233–59; idem, "Gersonides on Imitatio Dei and the Dissemination of Scientific Knowledge," *Jewish Quarterly Review* 85 (1995): 275–96; R. Ben-Meir, "Gersonides' Commentary on Ecclesiastes: Analysis and Text," Ph.D. dissertation, Hebrew University, 1993 (Heb.). The question of Gersonides' method of exegesis and its relation to Christian scholasticism has been discussed recently, with contradictory results. See S. Klein-Braslavy, "Les introductions" in C. Sirat, S. Klein-Braslavy, and O. Weijers, eds., *Les méthodes de travail de Gersonide et le maniement du savoir chez les scolastiques* (Paris: J. Vrin, 2003), pp. 193–215; C. Sirat, "Méthode de travail et liberté de penser," ibid., pp. 287–90; G. Freudenthal, "Gersonide, génie solitaire," ibid., pp. 291–317.

[40] See C. Touati, *La pensée philosophique et théologique de Gersonide* (Paris: Gallimard, 1992); J. Staub, *The Creation of the World according to Gersonides* (Chico, CA: Scholars Press, 1982); *The Wars of the Lord*, trans. S. Feldman, Vol. 3 (Philadelphia, PA: Jewish Publication Society, 1999), pp. 428–69; idem, "In the Beginning God Created: A Philosophical Midrash," in D. Burrell and B. McGinn, eds., *God and Creation: An Ecumenical Symposium* (Notre Dame, IN: University of Notre Dame Press, 1990), pp. 3–26; G. Freudenthal, "Cosmogonie et physique chez Gersonide," *REJ* 145 (1986): 295–314.

prime matter? Gersonides rejects both possibilities, arguing instead that it is the same quasi-matter he had hypothesized in his astronomical investigations; namely, he had established the existence of an interspherical quasi-matter that is a residue of the original "body that does not retain its shape."

Another interpretation worth mentioning is Gersonides' explanation of Joshua 10 – the sun's standing still in Gibeon – which caused particular ire in the later tradition.[41] In his commentary on the relevant verses he rejects the simple reading of the text and argues that the miracle was not astronomical but political or military: The Israelites' victory was so swift that it only seemed as if the sun had stood still. For Gersonides, had the sun really stood still the results would have been catastrophic: The lower world, the existence of which depends on celestial motion, would have been immediately destroyed. A literal reading of the story would violate his conception of miracles as well, for he considers miracles to be the product of the Active Intellect; yet the Active Intellect, the lowest of the celestial intelligences, cannot operate on superior bodies or intelligences.

Several other philosopher-exegetes of fourteenth-century Provence are worthy of note. Nissim ben Moses of Marseilles (fl. 1315–30) wrote *Maʿaśeh nissim,* which includes philosophical explications of biblical pericopes, preceded by a systematic discussion of several key philosophical and theological problems.[42] Joseph Ibn Kaspi (1279/80–1347) wrote commentaries – sometimes in duplicate or even triplicate – on most of the Bible, in which he introduces philosophical ideas and uses logic to unravel the mysteries of Holy Writ.[43] Later in the fourteenth century, Moses Narboni (1300–64), who, despite his name, seems to have lived more in Spain than Provence, also produced philosophical commentaries on the Bible as well as supercommentaries, including a peculiar explication of Ibn Ezra's commentary on Exodus 33:20–1.[44]

Much less is known about fifteenth-century Provence, but one important school of commentators is worth mentioning.[45] Its members did not write biblical commentaries per se, but rather commentaries on Judah Halevi's *Kuzari* and Levi ben Abraham's *Liwyat ḥen* and philosophical poem *Batte ha-nefesh ve-ha-leḥashim.* They explained all of these texts, even the *Kuzari,* in light of Maimonides, Ibn Tibbon, and Anaṭoli. Moreover, the emphasis in their writings is not only on philosophy but also on philosophical exegesis; they aimed to fully explain the exegesis found in the work of their predecessors.

The philosophical content of these writings is generally not original or creative. Yet it is precisely for this reason that the writings are important. They represent something like a

41 For discussion of this interpretation and the later criticisms of it, see M. Kellner, "Gersonides and His Cultured Despisers: Arama and Abravanel," *Journal of Medieval and Renaissance Studies* 6 (1976): 269–96. See also S. Feldman, "Sun Stand Still: A Philosophical-Astronomical Midrash," *Proceedings of the World Congress of Jewish Studies* 9, C (Jerusalem, 1986): 77–84; B. R. Goldstein, "Galileo's Account of Astronomical Miracles in the Bible: A Confusion of Sources," *Nuncius* 5 (1990): 3–16; D. Schwartz, "Did the Sun Stop for Joshua? A Chapter in the Theory of Miracles in Medieval Jewish Philosophy," *Daʿat* 42 (1999): 33–62 (Heb.).

42 See H. Kreisel, ed., *Maʿaśeh nissim: Peruš la-Torah* (Jerusalem: Mekize Nirdamim, 2000).

43 See, e.g., I. Twersky, "Joseph Ibn Kaspi: Portrait of a Medieval Jewish Intellectual," in idem, *Studies in Medieval Jewish History and Literature* (Cambridge, MA: Harvard University Press, 1979), pp. 231–57; B. Herring, *Joseph Ibn Kaspi's Gevia Kesef: A Study in Medieval Jewish Philosophic Bible Commentary* (New York: Ktav, 1982); S. Rosenberg, "Logic, Language, and Exegesis in the Writings of R. Yosef Ibn Kaspi," in M. Hallamish and A. Kasher, eds., *Religion and Language* (Tel Aviv: Mifʿalim universiṭa'iyim le-hotsa'ah le-or, 1981) (Heb.), pp. 105–13; H. Kasher, ed., *Joseph Ibn Kaspi, Šulhan kesef* (Jerusalem: Ben-Zvi Institute, 1996) (Heb.).

44 See A. Altmann, "Moses Narboni's Epistle on *Shi'ur Qoma,*" in idem, *Jewish Medieval and Renaissance Studies* (Cambridge, MA: Harvard University Press, 1967), pp. 225–64. See also M. R. Hayoun, *La philosophie et la théologie de Moïse de Narbonne (1300–1362)* (Tübingen: J. C. B. Mohr, 1989).

45 See D. Schwartz, "The *Kuzari* Renaissance in Jewish Philosophy," pp. 1*–40* (Heb. section) in I. Twersky and J. H. Harris, eds., *Studies in Medieval Jewish History and Philosphy*, Vol. 3 (Cambridge, MA: Harvard University Press, 2000).

scholastic tradition of Maimonidean philosophy and philosophical exegesis in later medieval Europe.

The Italian Tradition

Maimonides and Samuel Ibn Tibbon, along with Jacob Anaṭoli and Judah ben Solomon ha-Kohen (ca. 1215–after 1247), stand at the beginning of the Italian tradition of philosophy and philosophical exegesis. In particular, Anaṭoli, who spent several years at the court of Frederick II, was responsible for spreading the methods and ideas of the Provençal Maimonidean tradition on Italian soil. The writings of these figures, together with those by Averroes and Latin scholastics (Albertus Magnus, Thomas Aquinas, and Giles of Rome), contributed to the emergence of a distinctive school of philosopher-exegetes, including Zeraḥyah ben Isaac ben She'altiel Ḥen (fl. 1277–91), Immanuel ben Solomon of Rome (ca. 1261–before 1336), and Judah ben Moses ben Daniel Romano (ca. 1292–after 1330).

Judah ha-Kohen was originally from Toledo but moved to Italy, where he translated his encyclopedia of philosophy and science, *Midrash ha-Ḥokmah* (Search for Wisdom), into Hebrew.[46] In this encyclopedia, Judah incorporated exegetical sections, including philosophical commentaries on select verses from Genesis, Psalms, and Proverbs. Later figures in the Italian tradition cited and developed these sections.[47]

Like Judah ha-Kohen, Zeraḥyah Ḥen was from Spain; he was born in Barcelona, but moved early to Rome, where he was active as a translator, philosopher, and exegete.[48] His translations include works by Aristotle, Themistius, and Averroes, as well as the pseudo-Aristotelian *Liber de causis* – a text that would become particularly popular among the Italian philosopher-exegetes. Zeraḥyah wrote a commentary on the *Guide* and two philosophical commentaries on Scripture – on Proverbs and the book of Job.[49] Both commentaries draw heavily from the Provençal tradition, but start to introduce Neoplatonic ideas as well, especially from the *Liber de causis*.[50]

The most creative of the Italian philosopher-exegetes was Judah Romano.[51] Like Zeraḥyah, he was a translator, but of Latin scholastic rather than Arabic texts; these he

46 See in general R. Fontaine, "Judah b. Solomon ha-Cohen's *Midrash ha-Ḥokhmah*: Its Sources and Use of Sources," in *The Medieval Hebrew Encyclopedias*, pp. 191–210.

47 See D. Goldstein, "The Commentary of Judah b. Solomon Hakohen Ibn Matqah to Genesis, Psalms and Proverbs," *HUC Annual* 52 (1981): 203–52.

48 See Ravitzky, "Zeraḥyah b. Isaac b. She'altiel Ḥen."

49 The *Guide* commentary remains in manuscript form, but both biblical commentaries have been published. See *Tikvat Enosh*, ed. I. Schwartz (Berlin, 1868), pp. 169–293; *Imre Daath: Commentar über die Sprüche Salomo's von R. Serachja ben Isaac ben Shealtiel aus Barcelona*, ed. I. Schwartz (Vienna, 1871). The most recent discussion of the commentary on Job is Eisen, *The Book of Job*, pp. 111–45.

50 See, e.g., A. Ravitzky, "The Hypostasis of Divine Wisdom," *Italia* 3 (1981): 7–38 (Heb.).

51 On his work see J. Sermoneta, "Judah Romano's Commentary on the First Parashah of Genesis and its Sources," *Proceedings of the Fourth World Congress of Jewish Studies* (Jerusalem: World Union of Jewish Studies, 1969), 2: 341–2 (Heb.); idem, "Judah and Immanuel of Rome: Rationalism which in the End is Mystical Faith," in M. Hallamish and M. Schwartz, eds., *Revelation, Faith, and Reason* (Ramat Gan: Bar-Ilan University Press, 1976) (Heb.), pp. 54–70; idem, "Jehuda ben Mosheh ben Daniel Romano, traducteur de Saint Thomas," in G. Nahon and C. Touati, eds., *Hommage à Georges Vajda* (Louvain, 1980), pp. 235–62; idem, "Prophecy in the Writings of R. Yehudah Romano," in I. Twersky, ed., *Studies in Medieval Jewish History and Literature*, Vol. 2 (Cambridge: Harvard University Press, 1984), pp. 337–74; idem, "'Thine Ointments Have a Goodly Fragrance': Rabbi Judah Romano and the Open-Text Method," *Jerusalem Studies in Jewish Thought* 9 (1990): 77–113 (Heb.); idem, "Light: Its Substance and Function in Genesis according to Judah b. Moses b. Daniel Romano," in M. Oron and A. Goldreich, eds., *Massuot: Studies in Kabbalistic Literature and Jewish Philosophy in Memory of Prof. Ephraim Gottlieb* (Jerusalem: Bialik Institute, 1994), pp. 343–60 (Heb.); C. Rigo, "Judah Romano's Commentaries on the Bible: His Philosophical System as Contained in them and his Sources in Jewish Thought and Christian Scholasticism," PhD dissertation, Hebrew University, 1996 (Heb.); idem, "Human Substance and Eternal Life in the Philosophy of Rabbi Judah Romano," *Jerusalem Studies in Jewish Thought* 14 (1998): 181–222 (Heb.).

used in his commentaries on the Bible.[52] In general, his exegetical method represents an open encounter with the biblical text in light of the latest works of Latin science and philosophy. In Romano's opinion, the Bible is the product of the divine intellect; thus it contains every possible philosophical development, past and future. This premise leads to the peculiar result that Romano's commentaries are fluid and evolving, offering several different interpretations of the same verse, all in response to contemporary developments in science and philosophy. In a sense, then, the biblical commentary develops together with science; they are interrelated processes contributing to the gradual unfolding of divine truth.

Immanuel of Rome was far less creative and original than his younger cousin Judah, but he is no less interesting a figure in the history of philosophical exegesis.[53] Although he is known primarily for his poetry – he is called the "Hebrew Dante" for his Hebrew sonnets and short imitation of the *Divine Comedy* – Immanuel was also an exegete who produced voluminous commentaries on the Bible. These are mostly compilations rather than original works; they are composed of texts borrowed from his predecessors, including Ibn Ezra, Maimonides, Samuel Ibn Tibbon, Anaṭoli, and Judah ha-Kohen, as well as Zeraḥyah and Judah Romano.[54] It seems that Immanuel was interested not only in finding science and philosophy in the Bible but also in disseminating what had already been found. Through the collection and compilation of these sources he aimed to create an authoritative framework for the philosophical and scientific approach to the biblical text.

One final philosopher-exegete-anthologist is worth mentioning. Hanoch ben Solomon Alconstantini's *Mar'ot elohim* (Visions of God; fourteenth century), a philosophical explication of the chariot visions of the Bible (Isaiah 6; Ezekiel 1 and 10; and Zechariah), collects and synthesizes relevant passages from Maimonides' *Guide* and Ibn Tibbon's *Ma'amar Yiqqawu ha-mayim*, together with texts from Averroes and other philosophers, deriving from both Latin and Arabic sources.[55]

Christian Spain

Although Jewish scholarship in Christian Spain was often mystical, kabbalistic, and anti-philosophical (see the later discussion), there were important philosophical developments as well. A few examples are given in this section.

Already in the early thirteenth century, Jewish scholarship in Spain was tending toward kabbalah instead of philosophy. Gerona, Barcelona, Toledo, and Burgos were early centers

[52] For Judah Romano's sources and translations, see especially the articles by C. Rigo: "Un antologia filosofica di Yehuda b. Mosheh Romano," *Italia* 10 (1993): 73–104; "Yehudah b. Mosheh Romano traduttore di Alberto Magno (commento al De Anima III, II, 16)," *Henoch* 15 (1993): 65–91; "Le traduzioni dei commenti scolastici al De Anima eseguite da Yehudah b. Mosheh nella tradizione filosofica ebraico-italiana dei secoli XIII–XIV," in F. Vattioni, ed., *Atti della VII settimana: Sangue e antropologia nel Medioevo* (Rome: Primavera, 1993), pp. 1073–95; "Egidio Romano nella cultura ebraica: le versioni di Yehudah b. Mosheh Romano," *Documenti e studi sulla tradizione filosofica medievale* 5 (1994): 397–437; "Yehudah b. Mosheh Romano traduttore degli Scolastici latini," *Henoch* 17 (1995): 141–70.

[53] See D. Goldstein, "The Commentary of Immanuel ben Solomon of Rome on Chapters I–X of Genesis: Introduction, Hebrew Text, Notes," Ph.D. dissertation, University of London, 1966; idem, "Longevity, the Rainbow, and Immanuel of Rome," *HUC Annual* 42 (1971): 243–50; D. Schechterman, "The Philosophy of Immanuel of Rome in Light of his Commentary on the Book of Genesis," Ph.D. dissertation, Hebrew University, 1984 (Heb.).

[54] For Immanuel's sources see, in addition to the references cited earlier, D. Goldstein, introduction to *The Book of Proverbs with the Commentary by Immanuel of Rome, Naples, ca. 1487* (Jerusalem: Magnes Press, 1981) (Heb.); A. Ravitzky, "On the Sources of Immanuel of Rome's Proverbs Commentary," *Qiryat Sefer* 56 (1981): 726–39 (Heb.); Robinson, "From Digression to Compilation."

[55] See C. Sirat, *Les visions divines.* Ḥanokh b. Salomon al-Qonstantini. Introduction, traduction at notes (Jerusalem, 1976).

of kabbalah. Moreover, it was in these cities where the most vocal opponents of philosophy and philosophical exegesis were found. Yet the situation in Spain was in no way neat and uniform. Thus Isaac Albalag (thirteenth century), an Averroist, incorporated philosophical explications of Genesis 1 and Genesis 28 into his *Tiqqun ha-deʿot* (Improvement [or Correction] of the Opinions),[56] whereas Shem-Ṭov Falaquera (thirteenth century) seems to have produced a philosophical commentary on at least select passages from the Bible.[57]

Even those who tended toward kabbalah made use of philosophical and scientific ideas in their commentaries. For example, Isaac Ibn Laṭif (ca. 1210–80) drew extensively from Maimonides and the Maimonidean tradition in his commentary on Ecclesiastes, *Šaʿar ha-šamayim* (Gate of Heaven), and other works.[58] Naḥmanides (1194–1270), the great critic of Maimonides, himself used philosophy in his explication of creation and other texts, whereas Baḥya ben Asher (thirteenth century), who would become the authoritative exegete in the tradition of Naḥmanides, included not only literal, midrashic, and kabbalistic interpretations in his Torah commentary but also explications by way of philosophy.[59] Indeed, a major desideratum in scholarship is to systematically examine all of Baḥya's philosophical exegeses in relation to his predecessors and in the context of the history of philosophy.

In the fourteenth and fifteenth centuries there were two other important developments in Spain and also in Provence and Italy: commentaries on the *Guide* and, as already mentioned, supercommentaries on Ibn Ezra. Many of the commentaries on the *Guide* focus not only on its philosophical content but also on its exegesis; they explain, expand, and develop Maimonides' interpretations of key biblical texts. The supercommentaries on Ibn Ezra show interest primarily in science and philosophy. Their authors were especially attracted to the astrological interpretations, providing fuller discussion, identifying relevant sources, and revealing the secret knowledge that Ibn Ezra had so carefully concealed.

Iraq, Egypt, and Yemen

All of the post-Maimonidean developments discussed thus far took place in Europe and in Hebrew. Exegetes and philosophers responded to and built on the commentaries of Ibn Ezra, which were written in Hebrew, and the *Guide of the Perplexed*, in its Hebrew translation. Yet during Maimonides' lifetime and after his death, a Judeo-Arabic exegetical tradition continued to develop in the Islamic East as well. This was especially the case in Iraq, in Egypt, and in Yemen.

[56] Or, more fully: Improvement/Correction of the Opinions of the Philosophers Presented in al-Ghazālī's *Maqāṣid al-Falāsifa*. For Albalag's work, see G. Vajda, *Isaac Albalag: Averroïste juif, traducteur et annotateur d'al-Ghazālī* (Paris: J. Vrin, 1960); *Isaac Albalag, Sefer Tiqqun ha-deʿot*, ed. G. Vajda (Jerusalem: Israel Academy of Sciences, 1973). For a discussion of Albalag's exegesis, see S. Feldman, "In the Beginning God Created: A Philosophical Midrash," in *God and Creation: An Ecumenical Symposium*, pp. 3–26.

[57] See R. Jospe, *Torah and Sophia: The Life and Thought of Shem Tov Ibn Falaquera* (Cincinnati: HUC Press, 1988), pp. 459–84; R. Jospe and D. Schwartz, "Shem Tov Ibn Falaquera's Lost Bible Commentary," *HUC Annual* 64 (1993): 167–200.

[58] See S. Heller Wilensky, "Isaac ibn Latif's 'The Gate of Heaven': A Mystical Guide of the Perplexed," in M. A. Shulvas, *Perspectives in Jewish Learning*, Vol. 2 (Chicago: University of Chicago Press, 1966), pp. 17–25; idem, "Isaac Ibn Latif – Philosopher or Kabbalist?" in A. Altmann, ed., *Jewish Medieval and Renaissance Studies* (Cambridge, MA: Harvard University Press, 1967), pp. 187–223; idem, "Towards the Study of Isaac Ibn Latif's Sources," in *Proceedings of the Fourth World Congress of Jewish Studies* (1969), 2:4, pp. 317–26 (Heb.); idem, "The 'Guide' and the 'Gate': The Dialectical Influence of Maimonides on Isaac Ibn Latif and Early Spanish Kabbalah," in R. Link-Salinger, R. Long, and C. Manekin, eds., *A Straight Path: Studies in Medieval Philosophy and Culture in Honor of Arthur Hyman* (Washington, DC: Catholic University of America Press, 1988), pp. 266–78. See also the discussion of the anonymous *Doreš rešumot* (Seeker/Explainer of Traces/Mysteries) by Y. T. Langermann, "Cosmology and Cosmogony in *Doresh Reshumoth*, A Thirteenth-Century Commentary on the Torah," *HTR* 97 (2004): 199–227.

[59] For Naḥmanides and Baḥya b. Asher, see later notes.

Maimonides' near contemporary Abū al-Barakāt (d. after 1164), the maverick philosopher and physician of Baghdad, wrote a full philosophical commentary on Ecclesiastes, in which he introduced several of the original ideas found in his *Kitāb al-Muʿtabar*.[60] For example, in the commentary on Ecclesiastes 3:8 and 3:16, he discusses at length problems of fate and astral determinism. In the commentary on 5:7 he explains the limits of human knowledge and the need for tradition and authority, citing not religious tradition as the proper model but the a priori method of Euclid's *Elements*. In the commentary on 7:10 he considers the unreliability of secondhand reports and compares them to the inconsistent nature of natural phenomena. In the commentary on 10:4 he criticizes the astrologers of his time and people who make decisions based on horoscopes. And in the commentary on 12:9 he speculates about the literary history of Ecclesiastes in relation to other wisdom collections.

In the following century, Abraham ben Maimonides (d. 1237) and Tanḥum ha-Yerushalmi (d. 1291), the "Ibn Ezra of the East," wrote commentaries on much of the biblical corpus, building on the grammatical insights of Ibn Ezra and the philosophical insights of Maimonides.[61] In the fourteenth and fifteenth centuries, the writings of Maimonides stimulated the emergence of a rich tradition of philosophy and exegesis in Yemen as well. It took the form of Judeo-Arabic commentaries on the Bible as well as midrashic collections (in Hebrew, Aramaic, and Judeo-Arabic) that include many philosophical and scientific explanations, homilies, and digressions.[62]

All of these Eastern figures and movements had somewhat different philosophical interests than the Jewish scholars of Christian Europe. In particular, they gave more attention to Avicenna and post-Avicennan philosophy than to Averroes and had a stronger tendency toward Neoplatonic, Hermetic, Sufi, and Ismaili ideas and doctrines than to Aristotelian concepts. However, structurally they represent the same tradition of philosophical exegesis, which began in the early Middle Ages and continued through the fifteenth century and into the Renaissance.

ANTI-MAIMONIDEANISM

Although opposition to philosophical exegesis existed already in the early Middle Ages, it continued and gained increasing intensity in response to the spread of Maimonideanism. A series of "Maimonidean" controversies divided communities between those who defended and those who opposed philosophy and philosophical exegesis, and mystical-pietistic exegetical traditions that took the undermining of Maimonides and the Maimonidean tradition as their point of departure emerged. In the fifteenth century, this anti-philosophical tradition crystallized into a tradition of its own, with strong connections to contemporary trends of late medieval and Renaissance anti-Aristotelianism. All of these developments are surveyed here.

60 See Poznanski, "Aus Abū-l-Barakat Hibat-Allahs arabischen Kommentar"; S. Pines, "Studies in Abu'l-Barakāt al-Baghdādī's Poetics and Metaphysics," in *Studies in Abu'l-Barakāt al-Baghdādī: Physics and Metaphysics* (Jerusalem: Magnes Press, 1979), pp. 329–31, especially nn. 207–208; idem, "Toward the Study of Abū al-Barakāt al-Baghdādī's *Commentary on Ecclesiastes*: Four Texts," *Tarbiz* 33 (1964): 198–213 (Heb.); S. Stroumsa, "On the Maimonidean Controversy in the East: The Place of Abū al-Barakāt al-Baghdādī," in H. Ben-Shammai, ed., *Hebrew and Arabic Studies in Honor of Joshua Blau* (Tel Aviv: Tel Aviv University Humanities Faculty and Jerusalem: Hebrew University Department of Asian and African Studies, 1993) (Heb.), pp. 415–22.

61 See P. B. Fenton, "The Post-Maimonidean Schools of Exegesis in the East: Abraham Maimonides, the Pietists, Tanḥum ha-Yerushalmi and the Yemenite School," in *Hebrew Bible/Old Testament: The History of Its Interpretation*, Vol. 1, Part 2, pp. 433–55.

62 See Y. T. Langermann, *Yemenite Midrash: Philosophical Commentaries on the Torah* (New York: HarperCollins, 1996).

The Maimonidean Controversies

Near the end of Maimonides' life and after his death there were four major controversies – one in the East and three in the West – in Christian Spain and Provence. There were several smaller skirmishes as well. All of these controversies related, in one way or another, to the legitimacy and permissibility of philosophical exegesis.

During his lifetime, in the 1180s, Maimonides was accused by the Gaon Samuel ben ʿEli and others of denying the religious dogma of resurrection.[63] Samuel seems to have based this accusation on some reports from Yemen and on the philosophy of his contemporary in Baghdad, Abū al-Barakāt. It seems that it was an unsuccessful reply to Samuel by Maimonides' pupil, Joseph ben Judah Ibn Shimʿon, that prompted Maimonides himself to issue a statement on the subject. This took the form of his *Treatise on Resurrection* (1191), which is not only a defense of his position on resurrection but also an apologia pro vita sua. Among other things, he discusses and defends his method of allegorical exegesis.

The resurrection controversy repeated itself in the West.[64] Beginning with a query by Meir ben Todros Abulafia to the scholars of southern France (ca. 1202), it developed into a full intercommunal controversy: Abulafia suggested that Maimonides had denied resurrection, whereas Aaron ben Meshullam, the designated Provençal apologist, defended the master's orthodoxy. Like the controversy in the East, this one, too, ended with the publication of the *Treatise on Resurrection* – this time in Hebrew translation. The news of Maimonides' death in 1204 also seems to have contributed to a (temporary) cessation of hostilities.

Controversy broke out again in the 1230s,[65] when Solomon ben Abraham of Montpellier and his two disciples – Jonah Gerondi and David ben Saul – attempted to suppress the study of Maimonides and of philosophy among the Jews of southern France. Solomon appealed to the sages of northern France for support; when they issued a ban against the study of Maimonides, a local dispute turned into an international cause célèbre. At the center of the debate was the legitimacy of allegorical explications of the Bible and rabbinic literature. The dispute came to an end with the public burning of the *Guide* and *Book of Knowledge* in Montpellier around 1235.

The final "Maimonidean" controversy, in 1303–6, was most directly concerned with the dangers of philosophical exegesis.[66] Maimonides himself was no longer a target; instead it was his disciples and enthusiasts who were singled out for reproach and censure. This controversy began with the agitations of Abba Mari, a conservative Maimonidean who feared the public teaching of esoteric doctrines; it peaked with a ban by Rashba (Rabbi Solomon ben Abraham Ibn Adret) on the study of philosophy in 1305 and ended with the expulsion of the Jews from France in 1306. In the intervening years, many letters were sent between

[63] For background, see Stroumsa, "On the Maimonidean Controversy in the East"; idem, "Twelfth-Century Concepts of Soul and Body: The Maimonidean Controversy in Baghdad," in A. Baumgarten et al., eds., *Self, Soul, and Body in Religious Experience* (Leiden: Brill, 1998), pp. 313–34; idem, *The Beginnings of the Maimonidean Controversy in the East: Yosef Ibn Shimʿon's Silencing Epistle concerning the Resurrection of the Dead* (Jerusalem: Ben-Zvi Institute, 1999) (Heb.); Y. T. Langermann, "Samuel b. ʿEli's Epistle on Resurrection," *Qovez al yad* 15(25) (2001): 41–94 (Heb.).

[64] For background, see especially B. Septimus, *Hispano-Jewish Culture in Transition: The Career and Controversies of Ramah* (Cambridge, MA: Harvard University Press, 1982).

[65] For this controversy, see ibid.

[66] For this controversy, see especially G. Stern, "Menahem ha-Me'iri and the Second Controversy over Philosophy," Ph.D. dissertation, Harvard University, 1995; idem, "The Crisis of Philosophic Allegory in Languedocian-Jewish Culture (1304–6)," in Jon Whitman, ed., *Interpretation and Allegory: Antiquity to the Modern Period* (Leiden: Brill, 2000), pp. 187–207; idem, "Philosophy in Southern France: Controversy over Philosophical Study and the Influence of Averroes upon Jewish Thought," in D. Frank and O. Leaman, eds., *Cambridge Companion to Medieval Jewish Philosophy* (Cambridge, MA: Cambridge University Press, 2003), pp. 281–303. The last two articles include references to earlier studies.

Provence and Spain supporting and attacking the study of philosophy and the practice of philosophical exegesis. Most famous is Rashba's critique of philosophical preachers, who say that Abraham and Sarah represent matter and form, and the twelve tribes the twelve constellations.

Anti-Philosophical Exegesis

The controversies were never completely resolved; nor did the bans and censures prove to be an effective deterrent. Philosophy and philosophical exegesis continued unabated into the fourteenth and fifteenth centuries. However, there developed a more subtle and more effective way to combat philosophy, science, and philosophical exegesis. This was through the writing of mystical, non-philosophical, and anti-philosophical commentaries on the Bible.[67]

In fact, a kabbalistic and anti-philosophical tradition of biblical exegesis began to develop already in the early thirteenth century. At exactly the same time that Samuel Ibn Tibbon and Jacob Anaṭoli were promoting Maimonideanism, kabbalists in Provence and Catalonia were beginning to write kabbalistic and anti-philosophical commentaries on the Bible. Many of the early kabbalists – such as Azriel of Gerona, Ezra of Gerona, and Jacob ben Sheshet – also incorporated anti-philosophical readings into their systematic works and exegetical monographs.

The most important developments in anti-philosophical exegesis were the writings of Naḥmanides and his followers in the thirteenth and fourteenth centuries and the writings of Isaac Arama, Isaac Abarbanel, and other anti-Aristotelian exegetes in the fifteenth century. These figures and their writings are the focus of this section.

Naḥmanides and the Barcelona Tradition. Naḥmanides – legal scholar, communal leader, kabbalist, poet, and exegete – was the second major influence on later Jewish thought. He was born in 1194 in Gerona, spent most of his life in Gerona and Barcelona, and died in Acre, where he completed his commentary on the Torah. Although during the controversy of the 1230s he defended Maimonides, he spent much of his later life criticizing and undermining the work of his predecessor in law and in philosophy. This is evident in his critical glosses on the *Book of Commandments* and throughout his commentary on the Torah.[68]

Naḥmanides' commentary on the Torah, like Maimonides' *Guide of the Perplexed*, represents a turning point in the history of exegesis. Building on and criticizing the midrashic, grammatical, and philosophical interpretations of Rashi, Ibn Ezra, and Maimonides, and drawing from kabbalistic traditions to introduce explanations "by way of truth," Naḥmanides developed a rich and detailed, yet often enigmatic, exegetical style.[69] Throughout the commentary he is generally critical of philosophy and science; yet, as indicated earlier, he does cite philosophers, scientists, and physicians in positive ways as well – to help explain a difficult point in the text or to agree with their evaluations of nature. This "acceptance and

[67] For the history of kabbalistic exegesis, see in general M. Idel, *Absorbing Perfections: Kabbalah and Interpretation* (New Haven: Yale University Press, 2002).

[68] For background on Naḥmanides in general, and additional bibliography, see Y. Elman, "Moses ben Naḥman / Naḥmanides (Ramban)," in *Hebrew Bible/Old Testament: The History of Its Interpretation*, Vol. 1, Part 2, pp. 416–32.

[69] For Naḥmanides' exegetical method, see especially B. Septimus, "'Open Rebuke and Concealed Love': Naḥmanides and the Andalusian Tradition," in I. Twersky, ed., *Rabbi Moses Naḥmanides (Ramban): Explorations in His Religious and Literary Virtuosity* (Cambridge: Harvard University Press, 1983), pp. 11–34; E. Wolfson, "By Way of Truth: Aspects of Naḥmanides' Kabbalistic Hermeneutic," *AJS Review* 14 (1989): 103–78; M. Halbertal, *By Way of Truth: Naḥmanides and the Creation of Tradition* (Jerusalem: Shalom Hartman Institute, 2005) (Heb.).

devaluation" of science[70] gives the commentary an interesting dynamic. There is a constant tension between the miraculous and the natural, between a dogmatic call for total resignation to divine will and the admission of evidence for the workings of natural law.

This tension is particularly evident in Naḥmanides' discussion of miracles. Thus he writes (commentary on Exod. 13:16) that "a person has no portion in the Torah of Moses unless he believes that all things that happen to us are miracles; they have nothing to do with nature or the customary order of the world."[71] This and similar proclamations are modified and moderated in several places in the commentary. For example, he does admit the usefulness of medicine as well as other practical sciences. Nevertheless, the view that science is subordinate to religion generally prevails in his writings. In his opinion, the Torah contains all the wisdom of the philosophers and more; it teaches a spiritual science that links directly to the divine, a spiritual medicine that gives the righteous and pious special power with which they can triumph over the evil effects of this unredeemed world of matter.[72]

The tendency away from science and philosophy and toward the magical is evident in Naḥmanides' discussion of sacrifices. Contrary to Maimonides' famous historicist reading, Naḥmanides claims that the sacrificial cult was not instituted for the purpose of weaning the Israelites from ancient pagan practices but has value in its own right. Sacrifices help realign powers in the upper sefirotic world and also, it seems, bring down spiritual forces into the sublunar realm. His "secret of sacrifice" was particularly appealing to later students and supercommentators; some interpreted it in the direction of the theurgic, whereas others explained it in relation to hermetic traditions, linking the sacrifices to notions of talismanic magic.[73]

The anti-Maimonidean and anti-philosophical influence of Naḥmanides is felt throughout the thirteenth and fourteenth centuries, especially in Catalonia. He was succeeded by Rashba – who proclaimed a ban against philosophy in 1305 – followed by two generations of legal scholars, exegetes, and kabbalists. Of particular note are R. Yom Ṭov ben Abraham al-Ishbili (the Ritba), whose *Sefer Zikkaron* (Book of Remembrance) attempted to harmonize the teachings of Maimonides and Naḥmanides; Baḥya ben Asher, whose commentary on the Torah anthologized many of Naḥmanides' interpretations; Isaac of Acre, whose supercommentary on Naḥmanides' commentary on the Torah explains and emphasizes its kabbalistic as well as its anti-Maimonidean elements; and Joshua Ibn Shuayb, the first preacher to

[70] See Y. T. Langermann, "Acceptance and Devaluation: Naḥmanides' Attitude towards Science," *Journal of Jewish Thought and Philosophy* 1 (1992): 223–45.

[71] Trans. D. Berger, "Miracles and the Natural Order in Naḥmanides," in *Rabbi Moses Naḥmanides (Ramban)*, pp. 107–28, on p. 113.

[72] Several recent studies of Naḥmanides' theory of miracles have attempted to minimize the miraculous and emphasize the rational. See, e.g., Berger, "Miracles and the Natural Order in Naḥmanides"; M. Nehorai, "Naḥmanides' Theory of Miracle and of Nature and its Connections to Rabbi Yehudah ha-Levy," *Daʿat* 17 (1986): 23–31, with a reply by Berger, in *Daʿat* 19 (1987), 169–70; D. Novak, *The Theology of Naḥmanides Systematically Presented* (Atlanta: Scholars Press, 1992); Langermann, "Acceptance and Devaluation"; M. Halbertal, "The Theory of Miracles which Underlies the Concealed Miracle: Aspects of the Chain of Being in Ramban's Thought," *Kabbalah* 7 (2002): 257–80. Cf. J. Feldman ("The Power of the Soul over the Body: Corporeal Transformation and Attitudes towards the Body in the Thought of Naḥmanides," Ph.D. dissertation, New York University, 1999), who emphasizes the spiritualistic.

[73] See D. Schwartz, "From Theurgy to Magic: The Evolution of the Magical-Talismanic Justification of Sacrifice in the Circle of Naḥmanides and his Interpreters," *Aleph* 1 (2000): 165–213. For a discussion of the philosophical background, see also J. Stern, *Problems and Parables of Law: Maimonides and Naḥmanides on Reasons for the Commandments (Taʿamei Ha-Mitzvot)* (Albany: SUNY Press, 1998), chapter 6. For the supercommentators on Naḥmanides in general, see D. Abrams, "Orality in the Kabbalistic School of Naḥmanides: Preserving and Interpreting Esoteric Traditions and Texts," *Jewish Studies Quarterly* 3 (1996): 85–102.

introduce extensive kabbalistic material into his sermons.[74] The tradition continued into the fifteenth century as well. After the Black Death, in the mid-fourteenth century, Rabbenu Nissim ben Reuben Gerondi (the Ran) reestablished Barcelona as a major center of halakhic scholarship and anti-rationalism. Yet he, and his most famous disciple, Ḥasdai Crescas, started to move in a different direction as well. They drew on the emerging anti-Aristotelian philosophy of the later Middle Ages to undermine Aristotle and the Aristotelians with Aristotle's own tools.[75]

The Fifteenth Century. Rabbenu Nissim, Crescas, and the apostate Abner of Burgos (Alfonso de Valladolid)[76] are the first major figures of late medieval Jewish anti-Aristotelianism. Yet they were followed by many others, especially in fifteenth-century Spain, when disputations and increased conversionary pressures forced Jews to learn the ideas and techniques of Christian scholasticism. The two most famous and influential late-fifteenth-century Jewish anti-Aristotelians were Isaac Arama (ca. 1420–94) and Isaac Abarbanel (1437–1508). A few remarks about each of these figures are followed by one illustration of their anti-philosophical exegesis.

Arama was the last great Jewish preacher of Christian Spain.[77] His magnum opus is *Aqedat yiṣḥaq* (Binding of Isaac), a collection of sermons on the weekly Torah portion. The sermons are long and detailed and generally follow a formal pattern. Each begins with the citation of a rabbinic dictum or aggadah, presents a systematic discussion of a philosophical or theological problem, explains the verses in the pericope, and then returns to the rabbinic dictum.[78] Throughout his sermons Arama foments against the philosophers and uses philosophy, in quite remarkable ways, to undermine philosophy. In many cases, he shows greater knowledge and mastery of philosophy than do the philosophers he criticizes.

74 For background on Baḥya b. Asher, see E. Gottlieb, *Kabbalah in the Writings of R. Baḥya ben Asher Ibn Halawa* (Jerusalem: *Qiryat Sefer*, 1970) (Heb.); for Isaac of Acre, see A. Goldreich, "*Sefer Me'irat Einayim* by R. Isaac of Acre: A Critical Edition," Ph.D. dissertation, Hebrew University, 1981; for Ibn Shuayb, see C. Horowitz, *The Jewish Sermon in Fourteenth-Century Spain: The Derashot of R. Joshua Ibn Shu'eib* (Cambridge, MA: Harvard University Press, 1989).

75 For Rabbenu Nissim b. Reuben (the Ran), see especially the editions of his sermons and biblical commentary by L. Feldman: *Derašot ha-Ran ha-šalem* (Jerusalem: Mosad ha-Rav Kook, 2003); *Peruš ʿal ha-Torah* (Jerusalem: Makhon Shalem, 1968). See also S. Klein-Braslavy, "Vérité prophétique et vérité philosophique chez Nissim de Gérone: une interprétation du Récit de la Création et du Récit du Chariot," *Revue des études juives* 134 (1975): 75–99; idem, "The Gathering at Mount Sinai in the Thought of Rabbi Nissim b. Reuben Gerondi," *Sinai* 53 (1977): pp. 26–37 (Heb.); A. Ravitzky, "Kings and Laws in Late Medieval Jewish Thought: Nissim of Gerona vs. Isaac Abrabanel," in L. Landman, ed., *Scholars and Scholarship: The Interaction between Judaism and Other Cultures* (New York: Yeshiva University Press, 1990), pp. 67–90; W. Z. Harvey, "Nissim of Gerona and William of Ockham on Prime Matter," *Jewish History* 6 (1992): 88–98; idem, "Liberal Democratic Themes in Nissim of Girona," in *Studies in Medieval Jewish History and Literature*, Vol. 3, pp. 197–211; M. Lorberbaum, *Politics and the Limits of Law: Secularizing the Political in Medieval Jewish Thought* (Stanford, CA: Stanford University Press, 2001). For Crescas and his anti-Aristotelianism, see H. A. Wolfson, *Crescas' Critique of Aristotle* (Cambridge, MA: Harvard University Press, 1929); W. Z. Harvey, *Physics and Metaphysics in Ḥasdai Crescas* (Dordrecht: Kluwer Academic Publishers, 1998).

76 For Abner's anti-Aristotelianism, see, e.g., J. Hecht, "The Polemical Exchange between Isaac Pollegar and Abner of Burgos/Alfonso of Valladolid according to Parma MS 2440," Ph.D. dissertation, New York University, 1993, pp. 113–14.

77 For background on Arama, see especially S. Heller-Wilensky, *Isaac Arama and his Philosophical System* (Jerusalem: Mosad Bialik, 1956) (Heb.); idem, "Isaac Arama on the Creation and Structure of the World," *Proceedings of the American Academy for Jewish Research* 22 (1953): 131–50; B. Septimus, "Yitzhaq Arama and Aristotle's Ethics," in Yom Tov Assis and Yosef Kaplan, eds., *Jews and Conversos at the Time of the Expulsion* (Jerusalem: Merkaz Shazar, 1999), pp. 1–24.

78 For the formal nature of the late medieval sermon, see M. Saperstein, *Jewish Preaching 1200–1800, An Anthology* (New Haven, CT: Yale University Press, 1989), pp. 66–79.

If Arama was the most creative exegete and preacher in late medieval Spain, Abarbanel was the most refined.[79] He was the last in a long history of Hispano-Jewish statesmen, was the leader of Spanish Jewry at the time of the expulsion, and was also a philosopher, exegete, and messianic theorist. His massive commentaries on the Bible were completed after the expulsion, in Italy and elsewhere, but they represent – sometimes literally – the intellectual developments of pre-expulsion Spain. In his commentaries, Abarbanel cites and criticizes Maimonides and Gersonides, undermining their Aristotelian positions in every area of philosophy and theology – from the theory of knowledge and the Active Intellect to the arguments regarding the origins of the world. In response, he introduces ideas that would become standard doctrines of later anti-Aristotelian thought.

One fairly simple and straightforward example of Arama's and Abarbanel's anti-philosophical and anti-Maimonidean exegesis is the story of Jacob's dream of the ladder in Genesis 28, which was one of the key texts singled out by Maimonides.[80] In the preface to the *Guide*, Maimonides identifies it as a paradigmatic example of a biblical allegory and then explains it in two different ways in two chapters of the *Guide*. In *Guide* 1.15 he explains it politically: The angels ascending are the prophets, who ascend to God through study and then descend to rule the people. In *Guide* 2.10, by contrast, he hints at a cosmological explanation. Every part of the dream corresponds with some aspect of the natural world: The ladder itself represents the cosmos or chain of existence, which extends from the sublunar world into the celestial world; the rungs are the planets and spheres; the angels of God ascending and descending are celestial intelligences; and the Lord above is the first cause or prime mover.

These different interpretations were combined, expanded, and modified throughout the later Middle Ages by Samuel Ibn Tibbon, Jacob Anaṭoli, Isaac Albalag, Gersonides, Ibn Kaspi, Nissim of Marseilles, and many others.[81] They understood the dream as an injunction of sorts to ascend the ladder of wisdom toward knowledge of God. In the fifteenth century, in contrast, Abarbanel and Arama set out to sever any connection between Jacob's dream and the claims of philosophy. Abarbanel did this by means of philosophy itself.[82] How can the philosophers associate cosmological ideas with Jacob's dream, he asks, when Aristotle himself had shown that dreams are not a legitimate source of theoretical knowledge? For his part, Arama took an indirect exegetical approach.[83] Even if the dream is cosmological, he argued, its lesson is not philosophical but anti-philosophical. For no matter how far one ascends the ladder of wisdom, no matter how much one masters knowledge of the cosmos, God is still above the ladder. In other words, reason, no matter how well developed, will always remain subordinate to the inscrutable wisdom of God.

79 For Abarbanel, see especially E. Lawee, "Isaac Abarbanel's Intellectual Achievement and Literary Legacy in Modern Scholarship: A Retrospective and Opportunity," in *Studies in Medieval Jewish History and Literature*, Vol. 3, pp. 213–48; idem, *Isaac Abarbanel's Stance toward Tradition: Defense, Dissent, and Dialogue* (Albany, NY: SUNY Press, 2001); S. Feldman, *Philosophy in a Time of Crisis: Don Isaac Abravanel, Defender of the Faith* (London: RoutledgeCurzon, 2003).

80 For the interpretation by Maimonides, see S. Klein-Braslavy, "Maimonides' Interpretations of Jacob's Dream about the Ladder," *Bar-Ilan Year Book* 22–3 (1988): 329–49 (Heb.); J. Diamond, *Maimonides and the Hermeneutics of Concealment: Deciphering Scripture and Midrash in the Guide of the Perplexed* (Albany: SUNY Press, 2002), pp. 29–130.

81 For the history of exegesis of the ladder, see especially Altmann, "The Ladder of Ascension"; M. Idel, *Ascensions on High in Jewish Mysticism: Pillar, Lines, Ladders* (Budapest: Central European University Press, 2005), pp. 167–204.

82 See Don Isaac Abarbanel, *Peruš ʿal ha-Torah* (Jerusalem: Torah ve-Daʿat, 1964), commentary on Genesis 28 (pp. 313–20).

83 See Isaac Arama, *ʿAqedat Yiṣḥaq* (Pressburg, 1849), Vol. 1, pp. 184b–90b.

CONCLUSION

During the Middle Ages, philosophy and exegesis were closely linked: Philosophical ideas were taught and developed in relation to biblical texts, and biblical texts were explained in light of philosophy. This symbiotic relation between science and Scripture developed in response to a basic epistemological and theological problem: the need to resolve or harmonize contradictions between reason and revelation. In the later centuries, though, especially in Christian Europe, philosophical exegesis had practical functions as well. In particular, writing philosophy as exegesis helped create an authoritative framework for philosophy; it helped legitimize, defend, and even "naturalize" the study of "foreign" ideas and principles. Moreover, because the Bible was read by all, philosophical exegesis was a powerful pedagogical tool, an instrument of mass media, as it were, by which novel ideas and opinions could be introduced to the general public. Indeed, in many cases Jews had their first encounter with the sciences not in straightforward philosophical works but in commentaries on the biblical text.

These different motivations and functions of philosophical exegesis were active, in various degrees and combinations, in all the main periods and centers surveyed in this chapter, including the Islamic East, Andalusia, Provence, Italy, and Christian Spain. They apply in other areas as well, such as Byzantium during the fourteenth and fifteen centuries and Italy and Salonika during the fifteenth and sixteenth centuries.[84] Indeed, philosophical exegesis, with all its problems and concerns, continued to flourish into the seventeenth century. However, by the early modern period, the critical opinions and approaches of Arama and Abarbanel regarding philosophy itself and the relationship between philosophy and Scripture were beginning to predominate. In fact, there is a direct link between Crescas, Arama, and Abarbanel, on the one hand, and Benedict Spinoza, the founder of the modern critical study of the Bible, on the other. Thus with Arama and Abarbanel we can recognize the beginning of the end for philosophical exegesis. The Middle Ages were coming to a close; the interactions between philosophy and Scripture were moving in new directions.

[84] For Byzantium, see, e.g., D. Schwartz, "Conceptions of Astral Magic within Jewish Rationalism in the Byzantine Empire," *Aleph* 3 (2003): 165–211; D. Lasker, "Byzantine Karaite Thought," in *Karaite Judaism,* pp. 505–28; D. Frank, "Karaite Exegetical and Halakhical Literature in Byzantium and Turkey," ibid., 529–58. For Salonika, see, e.g., J. Sermoneta, "Scholastic Philosophical Literature in Rabbi Taitazak's 'Portat Yosef,'" *Sefunot* 11 (1971–7): 135–85 (together with the other articles on Saloniki in the same volume); K. Bland, "Issues in Sixteenth-Century Jewish Exegesis," in D. Steinmetz, ed., *The Bible in the Sixteenth Century* (Durham, NC: Duke University Press, 1990), pp. 50–67; Y. T. Langermann, "David ibn Shoshan on Spirit and Soul," *European Journal of Jewish Studies* 1 (2007): 63–86.

23

Kabbalah and Science in the Middle Ages

Preliminary Remarks

Hava Tirosh-Samuelson

The interplay between kabbalah and medieval science requires a book-length study and years of future research. This chapter is offered not as a set of definitive conclusions but as a preliminary suggestion to frame the relevant issues. I begin by clarifying different notions of "science" in Aristotle and in the Judaic variant of the Platonic view found in *Sefer Yeṣirah* (SY). Next I discuss the reception of SY in medieval Jewish philosophy in the tenth to twelfth centuries, before the rise of kabbalah, under the influence of Ismaili philosophy. I proceed to document the interest of kabbalists in SY, which became a foundational text in kabbalah and the subject of many commentaries. I argue that kabbalah preserved a philosophical-scientific outlook – an Ismaili version of medieval Neoplatonism – that Maimonides and his followers had rejected when they promoted Aristotelian science as the only authoritative scientific paradigm. Thus, during the thirteenth century, kabbalah and philosophy presented two alternative approaches to science. Both were elitist programs, and both saw themselves as the repository of the hidden meaning of the revealed text. However, in the 1220s the rationalist philosophers renounced the commitment to esotericism and began to disseminate philosophy to the public, whereas kabbalah remained committed to esotericism at least until the early 1270s. Thereafter kabbalah "went public," so to speak, in direct response to the dissemination of Aristotelian philosophy among the Jewish intelligentsia in Spain and Provence.

I illustrate the relationship between Aristotelian science and kabbalah by looking more closely at the polemical exchange about the origin of the universe between Jacob ben Sheshet and Samuel Ibn Tibbon during the 1230s. This exchange demonstrates that in the thirteenth century kabbalah was *neither* antiscientific nor ignorant of the science of its day, but rather that kabbalists subscribed to a Platonic notion of scientific knowledge and to a Neoplatonic cosmology that differed from the view of the Jewish Aristotelians. I conclude with a few reflections on the impact of kabbalah on the involvement of Jews in the natural sciences during the Late Middle Ages.

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PROLEGOMENA: ALTERNATIVE NOTIONS OF SCIENCE IN MEDIEVAL JEWISH THOUGHT

The Aristotelian Notion of Science

The relationship between science and kabbalah is difficult to articulate because of the ambiguity of the term "science." In modern parlance "science" denotes systematic, empirical observations of the natural world that lead to generalizations about the laws of nature, expressed most often in mathematical formulations. However, in the premodern world, "science" was understood much more broadly and was inseparable from philosophy. From the thirteenth century, the dominant conception of science among medieval Jewish philosophers was Aristotle's. For him, science was "a body of knowledge about some subject, organized into a system of proofs of demonstration."[1] Aristotle provided the precise and technical meaning of *episteme* (*scientia* in Latin) in the opening of the *Posterior Analytics*, writing that *episteme* is knowledge "when we know the cause on which the fact depends as the cause of the fact, and that the fact *could not be otherwise*" (71^b10ff.). Thus, to have scientific knowledge is "to have explanatory understanding: not merely to 'know' a fact incidentally, to be able to assent to something which is true, but to know why it is a fact."[2] Produced by demonstration (*apodeixis*), unqualified scientific knowledge is itself a form of syllogism. Such knowledge is necessary, eternal, universal, and irrefutable. For Aristotle, when we know *why* things are the sorts of things they are, we know the fundamental structure of the universe and the causal relationship of its components to one another.

Although Aristotle regarded science as inseparable from philosophy, he also differentiated between "First Philosophy" or metaphysics and "Second Philosophy" or physics. Metaphysics studies objects that are not subject to change (i.e., the separate intellects and the Unmoved Mover, or God); physics studies objects that undergo change in place or in quality or in both. However, for Aristotle physics is a theoretical science in a "secondary sense . . . insofar as it studies not motion but the principles of motion or the eternal causes of the non-eternal."[3] Because Aristotle's physics involved an elaborate discussion of philosophical concepts such as matter, form, privation, potentiality, and actuality, it was known as "natural philosophy."

The scope of Aristotle's physics was very wide indeed. It included not only the study of the structure and behavior of physical bodies (both terrestrial and celestial), namely cosmology, but also investigations of biological processes by the disciplines of zoology, botany, physiology, and anatomy; it even included the science of psychology, which studies the soul, the principle of motion of living things. The mathematical sciences of optics, harmonics, astronomy, and mechanics were also part of physics, because they studied the same objects of physics, but only in terms of their abstracted attributes.[4] The scientific inquiry of physics was facilitated by the various branches of the science of logic, which spells out the rules for correct reasoning and proper inference. Aristotle's corpus thus consisted of a vast body of empirical information about the physical world intertwined with theories about the causes responsible for all phenomena.

[1] Robin Smith, "Logic," in Jonathan Barnes, ed., *The Cambridge Companion to Aristotle* (Cambridge: Cambridge University Press, 1995), p. 47. On the several senses of "science" in Aristotle's philosophy, see also Patrick H. Byrne, *Analysis and Science in Aristotle* (Albany: SUNY Press, 1997), pp. 192–211.

[2] R. J. Hankinson, "Philosophy of Science," *Cambridge Companion to Aristotle*, p. 110. For further discussion, see G. E. R. Lloyd, *Early Greek Science: Thales to Aristotle* (New York: W. W. Norton, 1970), pp. 99ff.

[3] Marjorie Grene, "About the Division of the Sciences," in Allan Gotthelf, ed., *Aristotle on Nature and Living Things: Philosophical and Historical Studies Presented to David M. Balme on His Seventieth Birthday* (Bristol: Bristol Classical Press, 1985), pp. 9–26, on p. 12.

[4] John Herman Randall, *Aristotle* (New York: Columbia University, 1960), p. 163.

As a biologist, Aristotle's physical inquiries were concerned primarily with the process of growing. Differentiating among material, formal, efficient, and final causes, Aristotle accounted for change in nature by positing *immanent* factors. In nature there is no *conscious* purpose at work, but there are ends to natural processes. Always or for the most part, natural things grow into their mature nature; this determined process entails that nature as a whole is not random or haphazard, but exhibits order and regularity.[5] Although Aristotle's God as Prime Mover could have no role in directing intervention in natural processes, in his schema the acquisition of scientific knowledge about the natural world was not devoid of religious meaning. In fact, Aristotle maintained that scientific knowledge is possible for humans because they are endowed with the natural capacity to think, which distinguishes humans from other animals and makes them like God in some respect. When humans acquire knowledge and engage in the theoretical activity of contemplation, they actualize the highest faculty they possess – reason (*nous*). In so doing, humans are able to transcend their corporeal nature and partake in something divine; they become like God, who is engaged in eternal self-contemplation.[6] The scientific activity of observing and explaining processes in the physical world is the path that enables humans to be most like God.

When Aristotle's immanentist philosophy of nature was absorbed by medieval Islam, it was laced with Neoplatonic elements that gave it a more religious character. Nonetheless, when Jews encountered Aristotle's philosophy of nature, it posed a serious religious challenge to Judaism, notably on account of its doctrine of the eternity of the world and its denial of providence and of God's intervention in human history. Some familiarity with Aristotelian natural philosophy is already evident in the tenth century, in the works of Saadia Gaon; however, Judaism's absorption of Aristotelian science, which was quite different from the original Aristotle, began in earnest only in the twelfth century. In the first part of the twelfth century, Aristotelian philosophy was absorbed primarily in the Neoplatonized version of Avicenna, which was compatible with various versions of Neoplatonism prevalent among Arabic-speaking Jewish intellectuals at the time. With Abraham Ibn Daud's *Emunah ramah* (Exalted Faith), the shift in balance between Neoplatonic and Aristotelian philosophies began to emerge, but Jewish Aristotelianism became a cultural force only when Moses Maimonides claimed that Aristotelian science constitutes the inner meaning of the revealed Torah. By privileging Aristotelian science and by making it the guiding principle for the interpretation of Torah, Ibn Daud and Maimonides not only displaced existing scientific traditions prevalent among Jewish intellectuals but also made Aristotelian natural philosophy an integral part of the Jewish religious tradition.

The Platonic Notion of Science

To understand the emergence of alternative paradigms in Jewish philosophy during the twelfth century and their relevance to the interplay between kabbalah and science, we need to go back to the early centuries of Islam, when Greek and Hellenistic philosophy and science became available in Arabic. The Abbasid caliphs undertook the revival of these scientific traditions in a deliberate attempt to legitimize and glorify their new regime.[7] The scientific revival began with the mass translation into Arabic of the writings of Aristotle, Galen, Hippocrates, Ptolemy, and Euclid (to mention only the main Greek authors involved). Along with their works, a large body of Hermetic texts on magic, astrology, and alchemy was also

[5] Lloyd, *Early Greek Science*, p. 106.

[6] For further discussion of the religious import of Aristotle's science, see Jonathan Lear, *Aristotle: The Desire to Understand* (Cambridge: Cambridge University Press, 1988), p. 9.

[7] For an overview of the revival of the sciences by the Abbasids and its political significance, see Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early Abbasid Society* (London: Routledge, 1998).

translated into Arabic, accompanied by the translation from Pahlavi into Arabic of Indian astronomy, astrology, mathematics, and medicine and of Iranian astrology. Although the syncretism of scientific traditions took place prior to the translation movement, making all of these texts available in Arabic resulted in an important change: Not only did it considerably expand the list of sciences to be mastered by an educated Muslim during the eighth and ninth centuries, but it also changed the definition of science. In parallel to the definition of science as demonstrative, syllogistic knowledge, some circles adopted Plato's alternative notion, according to which scientific knowledge pertained not to the physical world of change (i.e., the world of Becoming), but to the changeless, necessary, eternal world of Being.

As James A. Weisheipl succinctly put it, Plato "denied the status of true 'scientific' knowledge to any theory of the natural world. For Plato, ultimate understanding of the phenomenological world was to be sought in mathematics and dialectics, which alone deserve the name of 'science.'"[8] In the Platonic worldview, scientific knowledge pertains *not* to the natural world known through the senses but to the intelligible forms, the eternal, timeless, changeless realities that are arranged in a hierarchical order, dominated by the Form of the Good, and that function as the first principles (*archai*) of the world.[9] Properly speaking, only knowledge of the intelligible forms constitutes "science" (*Timaeus* 27d–28a), but such knowledge is the privilege of the gods and of a small number of their friends (*Phaedrus* 278d). By contrast, knowledge whose objects are sensible particulars is no more than "opinion" (*doxa*), an inferior type of knowledge that is similar to but not identical with true knowledge. The two orders of reality – the intelligible and the sensible worlds – yield different orders of knowledge.

Plato had to explain how it is possible to know the ever-changing sensible world if true knowledge (*episteme*) can have as its objects only the intelligible forms, which remain inaccessible to human beings.[10] Plato answered this question in the *Timaeus* by offering a theory about the creation of the sensible universe by an artist god, the Demiurge (or Craftsman), who is good but not omnipotent, and who orders the primordial stuff (*khora*) in accordance with a "perfect paradigm" of intelligible forms, governed by the Form of the Good. The sensible universe is but a copy (*eikon*) of the "perfect paradigm," which manifests beauty, symmetry, order, harmony, and simplicity. In the Platonic model of the universe, all sensible particulars, including heavenly bodies, are made up of only four elements: fire, air, water, and earth. Their internal structure is calculated in *numerical values* of elementary components expressed *geometrically in spatial models.* These distinct components are few in number, simple, and indestructible; everything in the universe is made of them, and all change can be reduced to interactions among the elementary components, which can be described in mathematical terms.[11]

The details of Plato's cosmological theory and his spatial models to express the four elements cannot concern us here.[12] We should note only that Plato's *Timaeus* generated a tradition of commentaries starting in the Hellenistic period. Philo used the *Timaeus,* in

8 James A. Weisheipl, "Aristotle's Concept of Nature: Avicenna and Aquinas," in Lawrence D. Roberts, ed., *Approaches to Nature in the Middle Ages* (Binghamton, NY: Medieval and Renaissance Texts and Studies, 1982), pp. 138–60, on p. 143.

9 For an elaborate analysis of Plato's theory of forms as scientific knowledge, see L. P. Gerson, *God and Greek Philosophy: Studies in the Early History of Natural Theology* (London: Routledge, 1990), pp. 33–81.

10 See Luc Brisson and F. Walter Meyerstein, *Inventing the Universe: Plato's Timaeus, the Big Bang and the Problem of Scientific Knowledge* (Albany: SUNY Press, 1995), p. 20.

11 Ibid., p. 42.

12 For an elaborate discussion of Plato's cosmological theory in the *Timaeus,* see Gregory Vlastos, *Plato's Universe* (Seattle: University of Washington Press, 1975). For the career of the *Timaeus* in later Greek philosophy, see Gretchen J. Reydams-Schils, *Demiurge and Providence: Stoic and Platonist Readings of Plato's Timaeus* (Brepols: Turnhout, 1999); idem, ed., *Plato's Timaeus as Cultural Icon* (Notre Dame: University of Notre Dame Press, 2003).

combination with the Stoic philosophy of nature, to interpret Genesis.[13] As C. Anne Wilson noted, "The Neopythagoreans of the Hellenistic era took great interest in ancient Pythagorean number lore. . . . From the third century B.C. onwards, many forged texts circulated purporting to be by Pythagoras himself or by members of his immediate circle."[14] In the Abbasid empire, the Pythagorean/Platonic number lore was translated into Arabic and attributed to the apocryphal figure Jabir Ibn Ḥayyān.[15] Between 850 and 950, the Jabirian school employed the Greek number series as the cornerstone of an alchemical (proto-chemical) art, believing that it "represented the balance that sustained all existing things in the cosmos."[16] Thus Plato's *Timaeus* and its view of the universe gave rise to a textual tradition that was quite different from the original teachings of Plato, although it is justified to designate it "Platonic."[17]

A Judaic Version of the Platonic Notion of Science: *Sefer Yeṣirah*

The Platonic tradition, with its number lore, has a Jewish dimension that is extremely relevant to the relationship between science and kabbalah in the Middle Ages. I am referring to SY, the ancient text that "presented an elaborate cosmology which is grounded in the assumption that combinations of letters are both the technique to create the world and the material for this creation."[18] The precise time and place of the composition of SY are still a matter of a heated scholarly dispute.[19] The conventional view is that Palestine was the place of composition, although the dating of the text has varied from the second to the sixth centuries.[20] However, Yehuda Liebes has suggested Haran in northern Mesopotamia as the location and dates the text to the first century C.E., while the Temple was still in existence.[21] By contrast, Steven Wasserstrom has convincingly argued that SY emerged out of the "early medieval revival of Hellenism" in Islam,[22] which characterized the "Shii-gnostic revolution

[13] See David Runia, *Philo of Alexandria and the Timaeus of Plato* (Leiden: Brill, 1986); Reydams-Schils, *Demiurge and Providence*, pp. 132–65. It is reasonable to assume that if Philo had such extensive knowledge of the *Timaeus*, so did other Jewish intellectuals of his day.

[14] C. Anne Wilson, "Jabirian Numbers, Pythagorean Numbers and Plato's *Timaeus*," *Ambix* 35 (1988): 1–13, on p. 9. I thank Steven Wasserstrom for directing me to this essay.

[15] For an extensive study of this intellectual tradition, see Paul Kraus, *Jābir Ibn Hayyān: contribution à l'histoire des idées scientifiques dans l'Islam: Jābir et la Science grecque* (Paris: Les Belles Lettres, 1986 [Cairo, 1942]).

[16] Wilson, "Jabirian Numbers," p. 11.

[17] I use the phrase "Platonic tradition" rather loosely to denote the cluster of intellectual programs based on Plato's dialogues, including Middle Platonism, Neoplatonism, Hermeticism, and Ismailism. For our purpose we can lump them all together, even though each tradition was quite distinct, because of their common indebtedness to Plato's understanding of science.

[18] Moshe Idel, *Golem: Jewish Magical and Mystical Traditions on the Artificial Anthropoid* (Albany: SUNY Press, 1990), p. 29. The link between Philo and SY was suggested by Yehuda Liebes, *Ars Poetica in Sefer Yeṣirah* (Jerusalem: Schocken, 2000), pp. 105–20 (Heb.).

[19] For a summary of the disputed questions, see Joseph Dan, "Three Phases of the History of the *Sefer Yeṣirah*," *Frankfurter Judaistische Beiträge* 21 (1994): 7–29. For a Hebrew version of this essay, see idem, *On Sanctity: Religion, Ethics, and Mysticism in Judaism and Other Religions* (Jerusalem: Magnes Press, 1998), pp. 234–68. Among the various Jewish approaches to SY, Dan favors the view that it was intended as a scientific treatise about the origin and structure of the universe. This agrees with and is further supported by the present chapter. For a new critical edition, see A. Peter Hyman, ed. and trans., *Sefer Yeṣira: Edition, Translation and Text-Critical Commentary* (Tübingen: Mohr Siebeck 2004), which may help quell some of the debate.

[20] On the dating of SY, see Liebes, *Ars Poetica*, pp. 229–37; A. P. Hayman, "Sefer Yesira and the Hekhalot Literature," *Jerusalem Studies in Jewish Thought* (1987): 71–85, esp. p. 72.

[21] Liebes, *Ars Poetica*, p. 239.

[22] Steven Wasserstrom, "*Sefer Yeṣirah* and Early Islam: A Reappraisal," *Journal of Jewish Thought and Philosophy* 3 (1993): 1–30, on p. 7; Nehemiah Aloni, "Zeman Ḥibburo šel Sefer Yeṣirah," *Temirin* 2 (1982): 41–50. Wasserstrom reviewed the disputed issues and responded to Liebes in "Further Thoughts on the Origins of *Sefer Yeṣirah*,"

of the mid-eighth century"[23] and was linked to the "gnostic intellectualism" and "gnostic encyclopedism" of the early Islamic centuries that flourished among Shiite intellectuals, especially those associated with the Ismaili movement. Whether a primitive version of SY originated in an already Hellenistic environment or was the later product of the Hellenistic revival within Islam, it is clear that the text went through a long period of editorial activity; its final redaction, resulting in "long" and "short" variants of the text, probably took place during the ninth century.[24] The redacted versions of the text echo the Neopythagoreanism of Nicomachus of Gerasa (ca. 100 C.E.)[25] and manifest the influence of the Sabian culture of Haran in northern Mesopotamia.[26]

SY is part of the ancient esoterica that also included the *Shiur qomah* tradition and the Hekhalot and Merkabah texts. Whereas SY speculated about the creation of the universe (*maʿaśeh berešit*), the Hekhalot and Merkabah texts speculated about the celestial realms where God's abode is located and depicted the journeys of certain adepts to have a vision of God's Throne of Glory (*maʿaśeh merkavah*). Even though some members of the rabbinic movement in antiquity were deeply engaged with these esoteric speculations and the religious experiences they encompassed, the rabbinic movement as a whole reserved them to a few initiates and did not consider them a fit topic for all Jews. These traditions were esoteric in the sense that were not to be taught to all Jews and that they pertained to the mysteries of the universe and the mysteries of God.

SY stood at the heart of Jewish esoteric speculations about the origin and structure of the universe (*maʿaśeh berešit*). Composed as a rewrite of the biblical Genesis, SY delved into the mysteries of creation, depicting God as the Great Magician/Artist who created the world by manipulating the twenty-two letters of the Hebrew alphabet and the ten sefirot.[27] Together these constitute thirty-two "wondrous pathways of wisdom" (*netivot pelaʾot ḥok̲mah*) whose infinite permutations, through deconstruction and recombination, explain space, time, and life (especially human life). SY's theory about the letters and the sefirot amounted to a

Aleph: Historical Studies in Science and Judaism 2 (2002): 201–21. My chapter shares Wasserstrom's claim that "SY belongs to the history of science" (ibid., p. 218) and applies this idea to medieval kabbalah.

23 Wasserstrom, "*Sefer Yeṣirah*," p. 3.

24 On the long and short versions of SY, see Ithamar Gruenwald, "A Preliminary Critical Edition of *Sefer Yeṣirah*," *Israel Oriental Studies* 1 (1971): 132–77; Y. Tzvi Langermann, "A New Redaction of *Sefer Yeṣirah*," *Kabbalah: Journal for the Study of Jewish Mystical Texts* 2 (1997): 49–63. The redactional complexity of SY goes beyond the existence of two versions of different length, given that the cosmology of the first chapter is quite different from the cosmology of the subsequent chapters. In the first chapter, "air" is the ontological foundation of the letters, whereas in the subsequent chapters, the twenty-two letters of the Hebrew alphabet take primacy as the *archai* of the universe.

25 That Nicomachus of Gerasa was a probable source of SY has been noted by several scholars who highlighted the work's Neopythagorean tendencies. It is important to note, though, that Nicomachus's *Introduction to Arithmetic* was "the work of a philosopher rather than a mathematician, intended as a guide to the late works of Plato and to the Pythagorean treatises, first read by philosophers rather than mathematicians" (Gerhard Endress, "Mathematics and Philosophy in Medieval Islam," in Jan P. Hogendijk and Abdelhamid I. Sabra, eds., *The Enterprise of Science in Islam: New Perspectives* [Cambridge, MA: MIT Press, 2003], pp. 122–76, on p. 125). The Arabic translation of Nicomachus by the Sabian scholar Thabit Ibn Qura (d. 910) played an important role in the arithmology of the Ismaili *Ikhwan al Safaʾ* and in the corpus of alchemy and the occult sciences ascribed to Jabir Ibn Ḥayyān.

26 On Haran as the center of Sabian culture and its contribution to the revival of Hellenistic science in the eighth and ninth centuries, see Francis E. Peters, "Hermes and Harran: The Roots of Arabic-Islamic Occultism," in M. M Massauoui and Vera B. Moreen, eds., *Intellectual Studies on Islam* (Salt Lake City: University of Utah Press, 1990), pp. 185–215.

27 See A. P. Hayman, "Was God a Magician? *Sefer Yeṣirah* and Jewish Magic," *Journal of Jewish Studies* 40(2) (1989): 225–37. A similar conception of the letters appears in *Sefer ha-Razim* and has parallels in Greek magical papyri. The Greeks, Jews, Mandeans, and Arabs all assigned numerical values to the letters of their respective alphabets.

"linguistic ontology" and a "cosmic semiotics,"[28] in which the letters of the Hebrew alphabet are considered to be the actual "building blocks" of the cosmos. According to SY the world is a linguistic product constructed by God, the artist-poet.

The terse, poetic, and dense language of SY does not depict natural processes of the created world but rather the first principles – the ten sefirot and the twenty-two letters – that God "inscribed" and "engraved" on the ideal model of the universe. Because the Hebrew letters have numerical values, the model was mathematical, describing the universe as a cube whose sides desire to extend infinitely.[29] SY's linguistic theory is reminiscent of Plato's cosmic model in the *Timaeus*, although in all likelihood it was not derived directly from the *Timaeus*, but rather from the Jabirian school mentioned earlier. Like Plato's *Timaeus*, SY presents the universe as a *geometrical model* constructed of the elemental numbers.[30] Both texts understand the creation of the universe to be a productive (i.e., poetic) process brought about by an artist-creator. In both cosmologies, elemental, indivisible, abstract entities (i.e., numbers or letters that have numerical values) are real, and their combination creates space or spatial relations that can be expressed geometrically. Both books, then, are about the first principles (*archai*) of the universe, and both present their content as the highest forms of knowledge, that is, as "science." Most important, in both books the science of numbers/letters does not pertain to the empirical world known through the senses, because, as Amos Funkenstein put it succinctly and insightfully, "Nature is but a metaphor for reality."[31] In SY, as in the *Timaeus*, mathematics does *not* connect with physics as the domain of motion and change, because physics belongs to the imperfect world of Becoming, whereas the mathematical models pertain to the ideal world of Being. This is why SY, like the *Timaeus*, should be construed as a work offering an account of the universe, albeit in a very different sense from that of Aristotelian science.

Similarities notwithstanding, there are also several important differences between the Jewish text and the Platonic dialogue. The most relevant to us is SY's linguistic ontology and cosmic semiotics. In SY the letters are not merely devices for mathematical calculations (as letters were used also by the Greeks). Because letters were the primordial "stuff" from which the universe was created, the spatio-temporal model of the universe presented in SY is inseparable from the meanings and connotations of words in the Hebrew language and from the beliefs of the Jewish religion. Unlike the *Timaeus*, then, the model of the universe in SY is culturally specific: It is distinctively Jewish. At the center of the spatial order stands the Jerusalem Temple, and in the center of the temporal order is the Sabbath, the eternal present.[32] Indeed, being at the center, or centrality per se, is the attribute of God according to SY. This is why SY's attempt to provide a scientific explanation of the universe is inseparable

[28] "Linguistic ontology" highlights the claim that the letters are the *archai* of reality; "cosmic semiotics," a phrase used by Steven Wasserstrom, focuses on the physical manifestation of this ontology (i.e., the physical cosmos). The term "semiotics" is appropriate in this context if we keep in mind that *semiosis* means the exchange of signs, a dynamic and relational approach to the construction of meaning.

[29] See Liebes, *Ars Poetica*, pp. 190–208. It is important to note that although letters have numerical values, SY does not make use of the technique of *gematria*, unlike the *ʾOtiyot de-Rabbi Aqiva*, which has some features in common with SY. See Liebes, *Ars Poetica*, p. 178.

[30] The spatial dimension in SY is expressed primarily through the poetic references to the divine activity of measuring, rather than through discussion of geometric shapes as in the *Timaeus*. Nonetheless, both SY and the *Timaeus* posit the cube as the ideal paradigm of the universe.

[31] Amos Funkenstein, *Theology and Scientific Imagination: From the Middle Ages to the Seventeenth Century* (Princeton: Princeton University Press, 1986), p. 33.

[32] Liebes, *Ars Poetica*, p. 191; Adam Afterman, *Intention of Prayer in Early Ecstatic Kabbalah* (Los Angeles: Cherub, 2004), pp. 67–9 (Heb.). Steven Wasserstrom proposes a different reading of SY (personal communication, 2006). According to him, SY responds to the astral cult of the Sabian seven temples, based on the notion that humans can draw down spirituality through certain verbal and ritual practices. SY is thus more "Ars Technologia" than "Ars Poetica."

from myth. By this I do not just mean that the abstract theories of SY are expressed in poetic language, but that they are inseparable from the sacred narrative, or myth, of Judaism about the relationship among God, the people of Israel, and the Land of Israel.

Just as SY conflates science and myth, the ancient text also links science to magic. SY claims to disclose the operative set of instructions, or program, of the creative process.[33] Mastery of this abstract knowledge (or, more precisely, information) has productive and practical results. Because the letters are the primordial "stuff" of the cosmos, mastering the science of letter combination could presumably lead the knower to control and manipulate the world made out of the letters. Moreover, the knower can even bring new entities into existence – that is to say, engage in magic. Magic is a praxis based on the belief that human beings are able to control, coerce, and manipulate the occult forces of creation by means of ritual techniques. The absorption of magic in Rabbinic Judaism is evident in the famous story about R. Ḥanina and R. Oshaya, who presumably exploited the knowledge of SY to create a calf (BT Sanhedrin 65b). The talmudic traditions about the creation of an artificial man, the golem, were also predicated on mastery of information provided in SY. Scholars debate the degree to which SY itself was a magical text, a part of the Greek magical tradition.[34] We need not enter this debate but only suggest that, even if SY was not a magical text and merely used the magical knowledge of antiquity for its own purposes, the perception of SY as a magical text, in antiquity and the early Islamic centuries, was warranted.

ENGAGEMENTS WITH *SEFER YESIRAH* PRIOR TO KABBALAH

Sefer Yeṣirah and a Jewish Philosophical Debate

Before the rise of kabbalah, the linguistic theories of SY served Jewish intellectuals as the framework not so much for the doctrine of creation but rather for the doctrine of divine attributes, which was also a hotly debated issue among the Muslim theologians of the time. The debate about the ontological status of the divine attributes is part of the interreligious disputes with Christian theologians about the Trinity as well as of the intrareligious debates between the Muʿatazilite and Asharite theologians about the unity and power of God.[35] Similarly, during the tenth and eleventh centuries, Jewish theologians acquainted with SY debated whether the sefirot are intra-deical or extra-deical attributes of God, a debate that had pertained to the personalist or the abstract nature of God. Those intellectuals who viewed the sefirot as extra-deical regarded the knowledge of the sefirot as part of the knowledge of the natural world created by God as distinct from the knowledge of God, whereas those who

[33] Afterman applies the term "algorithm" to this working program; see Afterman, *Intention of Prayer*, p. 55.

[34] The degree to which "magic" was part of ancient Judaism is the subject of intense debate. Peter Schäfer has expressed skepticism about the claim that these rabbinic traditions attest to the rabbis' actual involvement in magic practices. See Peter Schafer, "Magic of the Golem: The Early Development of the Golem Legend," *Journal of Jewish Studies* 46 (1995): 249–61; idem, "Jewish Magic Literature in Late Antiquity and Early Middle Ages," *Journal of Jewish Studies* 41 (1990): 75–91. For a theoretical discussion of the meaning and scope of magic and its place in Judaism, see idem, "Magic and Religion in Ancient Judaism," in Peter Schäfer and Hans G. Kippenberg, eds., *Envisioning Magic: A Princeton Seminar and Symposium* (Leiden: Brill, 1997), pp. 19–43. Moshe Idel, by contrast, insists that magic was central to the mystical praxis of ancient Jewish mystics and that Rabbinic Judaism as a whole is inseparable from a magical view of commandments as ritual that empower God. See Moshe Idel, "On Judaism, Jewish Mysticism and Magic," in *Envisioning Magic*, pp. 195–214, esp. p. 199. The appropriateness of the term "magic" has been questioned by Alan F. Segal, "Hellenistic Magic: Some Questions of Definition," in R. Van den Broek and M. J. Vermaseren, eds., *Etudes préliminaires aux religions orientales dans l'empire romain* (Leiden: Brill, 1981), pp. 349–75. He argues that "no definition of magic can be universally applicable because 'magic' cannot and should not be construed as a properly scientific term. Its meaning changes as the context in which it is used changes" (pp. 350–1).

[35] See Harry A. Wolfson, *The Philosophy of the Kalam* (Cambridge, MA: Harvard University Press, 1976), pp. 112–234.

regarded the sefirot as intra-deical identified the knowledge of the sefirot as "divine science" par excellence (*ḥokmat ha-ʾelohut*).

Saadia Gaon, the main defender of the authority and rationality of Rabbanite Judaism against the Karaite critique, belongs to the first group of theologians. Against the Karaites, Saadia Gaon argued that Rabbanite Judaism was fully compatible with or superior to current philosophical and scientific theories, be they Platonic, Stoic, Neoplatonic, Neopythagorean, or Aristotelian.[36] Saadia, who was the first to compose a commentary on SY, engaged these theories mainly lexicographically and exegetically, interpreting the meaning of words and verses in Scriptures or in rabbinic texts in light of prevalent scientific theories. With regard to SY, Saadia was particularly concerned about its association with magic. He was willing to admit that it was based on an oral tradition that may have reached back to patriarchal times, but he maintained that the particular phrasing of the text was rabbinic and not of patriarchal origin. The text belonged to the mishnaic period, and its wording was not sacred.[37] As Haggai Ben Shammai showed, following Georges Vajda, Saadia's commentary on SY, written in 931, was intended "to bridge the gap between *Sefer Yeṣirah* and the scientific achievements of Saadia's time"; "by detach[ing] the work from mythical, mystical or magical elements which had possibly been attached to it by earlier commentators," Saadia could "establish *Sefer Yeṣirah* as a philosophical work within the framework of rabbinic Judaism."[38] Saadia's commentary thus demythologized the ancient text and "establish[ed] it as a philosophical text worthy of philosophical consideration."[39] For Saadia, the numbers and the letters are not creative forces in themselves but only abstract principles that describe mathematical relations between existing entities in the physical world.[40] Thus Saadia fit SY into his own notion of science.

Other Arabic-speaking Jewish philosophers continued to engage with SY during the tenth century, but interpreted the sefirot quite differently than Saadia had. For example, Dunash Ibn Tamim of Kairouan (d. ca. 960), who studied with Isaac Israeli, composed a commentary on SY, which he regarded as a philosophical text; his goal was to reveal "what the original author meant and explain those places cited by Rabbi Saadia in which he erred and was mistaken."[41] Whereas for Saadia the sefirot meant "categories of quantitative characteristics

[36] Saadia Gaon's Aristotelian, Platonic, and Neoplatonic sources were identified by scholars long before. See, for example, Israel Efros, *Studies in Medieval Jewish Philosophy* (New York: Columbia University Press, 1974), pp. 3–137. For his Stoic sources, see Gad Freudenthal, "Stoic Physics in the Writings of R. Saadia Gaʾon al-Fayyumi and Its Aftermath in Medieval Jewish Mysticism," *Arabic Sciences and Philosophy* 6 (1996): 113–36.

[37] Joseph Kafiḥ, ed. and trans., *Sefer Yeṣirah [Kitab al-Mabādiʿ] ʿim Peruš ha-Gaʾon Rabbenu Saʿadya b. Yosef Fayumi* (Jerusalem: Ha-Waʿad le-Hotza'at Sifrey Rasag, 1972), p. 142; see also Georges Vajda, "Saʿadya Commentateur du *Livre de la Création*," *Annuaire de l'École Pratique des hautes Études, Sciences Religieuses* (Paris, 1959–60): 33–59, on p. 7.

[38] Haggai Ben-Shammai, "Saadya's Goal in his Commentary on *Sefer Yeṣirah*, in Ruth Link-Salinger, ed., *A Straight Path: Studies in Medieval Philosophy and Culture* (Washington, DC: Catholic University Press, 1988), pp. 1–9, on pp. 2 and 9, respectively.

[39] Raphael Jospe, "Early Philosophical Commentaries on the *Sefer Yezirah*: Some Comments," *Revue des études juives* 146 (1990): 369–415, on p. 373. This interpretation was first proposed by Georges Vajda, "Saʿdya Commentateur."

[40] It might prove instructive to compare Saadia's treatment of the sefirot as ideal numbers to two treatises by his Muslim contemporaries Alfarabi (d. 950) and Ibn Masarra (d. 931), both entitled *Kitab al-Ḥuruf* (Book of Letters). I owe this point to S. Wasserstrom.

[41] Jospe, "Early Philosophical Commentaries," p. 382. Ibn Tamim, we should note, composed an important astronomical treatise, the *Book on Operations with an Astronomical Instrument Called the Armillary Sphere,* which, in the words of Marco Zuccato, deals with "the structure of the world and the instruments used by the ancients to indicate the structure of the heaven." This text was known to Ḥasdai Ibn Shaprut, the tenth-century physician-diplomat and head of the Andalusian Jewish community who served Abd al-Raḥman III and his son, al-Ḥakam II. His diplomatic contacts with the rulers of the Iberian Christian kingdoms enabled Ḥasdai to disseminate Jewish and Arabic science to Christian scholars. See Marco Zuccato, "Gerbert of Aurillac and a Tenth-Century Jewish Channel for the Transmission of Arabic Science to the West," *Speculum* 80 (2005): 742–63, esp. 755–8.

that apply to all existents ... [and as such] are extrinsic to God,"[42] in Dunash Ibn Tamim's commentary, they "are not considered ordinary numbers but rather signify powers or aspects in the divine world, understood in this context Neoplatonically as the sphere of intelligible entities."[43] For Ibn Tamim, knowledge of the sefirot constitutes the "divine science" (*ḥokmat ha-ʾelohut*), "which deals with God's unity (*yiḥud*) and with the intelligible world." In other words, for Dunash the sefirot are not only intelligible, immutable, eternal forms that are the subject matter of metaphysics; they are also categories that capture intra-deical processes. The "divine science" teaches truths not only about the relationship between God and the cosmos but also about processes that take place within God. Put differently, the divine science is not merely knowledge *about* God but knowledge *of* God. In this regard, the knowledge of sefirot and the letters is *gnosis*, namely, knowledge that has soteriological or salvific power.[44]

The theosophic interpretation of SY was even more pronounced in the commentary by Shabbetai ben Abraham Donnolo (d. ca. 982), entitled *Sefer Ḥakhmoni*. In accord with SY, Donnolo considered the cosmos to be a linguistic construct, but his cosmological theory relates the sefirot and the art of letter combination to the science of astrology, a secret wisdom by which God created the universe and through which human beings gain knowledge of this creative process.[45] Donnolo regarded astrology as a science in the exclusive preserve of gentiles. The goals of the commentary were to show that Jewish astrological information is in accord with Greek and Arabic sources and, even more importantly, to establish knowledge of the sefirot as a science superior to astrology. In Donnolo's cosmological theory, the sefirot constitute a "sphere beyond the celestial realms, and therefore *gnosis* connected with them, whatever form it takes, must be higher or more sublime than astrology."[46] Donnolo's work illustrates that already in the tenth century, Jewish theologians took SY to be a text in natural philosophy, that is, a deep speculation about the origin and structure of the universe as well as knowledge of God that exceeds scientific information or ordinary modes of knowing as found in the books of the "nations." With Donnolo begins the view of the sefirot as "incomprehensive entities which constitute the luminous, immeasurable and unfathomable powers, the invisible image of God,"[47] which will be adopted both by Ḥasidei Ashkenaz and by medieval theosophic kabbalah, to be discussed later.

The Influence of Ismailism

Although Donnolo's reflections on the sefirot were carried out in Italy in a Hebraic linguistic matrix, interest in SY as a scientific text continued among Jewish philosophers in

The scientific activity of Dunash Ibn Tamim further supports the claim that in the tenth century, the study of SY and its doctrine of sefirot, which gave rise to kabbalah, was part of the scientific-philosophical discourse.

42 Elliot R. Wolfson, "The Theosophy of Shabbetai Donnolo, with Special Emphasis on the Doctrine of *Sefirot* in his *Sefer Ḥakhmoni*," *Jewish History* 6(1–2) (1992): 281–316, on p. 288.

43 Ibid.

44 The ongoing debate about the "Gnostic" character of early kabbalah is riddled with ambiguity because the term denotes a cluster of heterodox ideologies of Late Antiquity (both Jewish and Christian), the transformation of these ideas in early Islam (especially in Ismailism), and a claim about the salvific power of certain religious knowledge. The ambiguity was noted by Henry Corbin, "From the Gnosis of Antiquity to Ismaili Gnosis," in his *Cyclical Time and Ismaili Gnosis* (London: Kegan Paul International, 1983), pp. 151–93.

45 On the perception of astrology as the "mistress of the sciences" during the Abbasid period, see Gutas, *Greek Thought, Arabic Culture*, pp. 108–10. On the use of astrology in SY and its medieval commentaries, including Donnolo's, see Ronald Kiener, "The Status of Astrology in the Early Kabbalah from the Sefer Yesirah to the Zohar," *Jerusalem Studies in Jewish Thought* 6(3–4) (1987), English section pp. 1–42. According to Kiener, "for Donnolo astrology takes on the status of a primordial divine gnosis, a key to the fate of all future generations" (p. 14).

46 Wolfson, "The Theosophy of Shabbetai Donnolo," p. 297.

47 Ibid, p. 300.

Muslim Spain under the distinctive influence of Ismaili culture.[48] The intellectual-religious brotherhood of the *Ikhwan al-Safāʾ* (Brethren of Purity) of Basra shared an interest in linguistic ontology, cosmic semiotics, and number symbolism, characteristic of SY. About 960 this Shiite group circulated a scientific encyclopedia in the form of fifty-two epistles, which blended scientific elements from Neopythgoreanism, Neoplatonism, Hermeticism, and Aristotelianism.[49] Covering the mathematical, natural, psychological, and religious sciences, the *Ikhwan* fused Aristotelian scientific concepts such as matter, form, substance, accident, potentiality, and actuality with the Neoplatonic doctrine of emanation and the Neopythagorean devotion to number and to certain numbers, especially the number four. They emphasized the symbolic structure of the world and viewed numbers as the key to uncovering the unity and harmony that underlie multiplicity in the physical world. The *Ikhwan* shared the Pythagorean belief that "the nature of created things accords with the nature of number"[50] and

> conceived of creation as a series of emanations proceeding from the absolutely incomprehensible God. Every facet of the universe mirrored every other, itself, and the hidden God. An intricate and inexhaustible series of hidden affinities and resemblances, nature hid itself within layer upon layer of occult qualities. All aspects of reality possessed both inner and outer meanings. The purely exoteric sciences were merely the vehicles so to speak, that carry the esoteric meanings hidden within them. The universe was like a cosmic text whose inner meaning can be understood only by symbolic interpretation and not by a "literal" reading. To the Ismaili, natural phenomena were transparent symbols whose real message was spiritual. Science was a hermeneutics of nature, and the symbolic interpretation of the Koran became the basis of the symbolic study of nature.[51]

The teachings of the *Ikhwan al-Safāʾ*, which arrived in Spain in the eleventh century, influenced Jewish rationalists in the eleventh and twelfth centuries, as evident in the writings of Judah Halevi;[52] traces could be found among kabbalists in the thirteenth century, as in the writings of Isaac Ibn Latif.[53] Of course, Jewish scholars did not derive their scientific knowledge only from the encyclopedia of the *Ikhwan*. Other Muslim philosopher-scientists – for example, al-Kindi (d. 870), Alfarabi (d. 950), al-Amiri (d. 922), al-Kwarizmi (fl. 975), Ibn Sina (d. 1037), Ibn Ḥazm (d. 1064), and Fakhr al-Din al-Razi (d. 1209) – also composed

[48] For an overview of the history of Ismailism, see Farhad Daftary, *A Short History of the Ismailis: Traditions of a Muslim Community* (Princeton: Marcus Wiener; Edinburgh: Edinburgh University Press, 1998); idem, *The Ismāʿīlīs: Their History and Doctrines* (Cambridge: Cambridge University Press, 1990).

[49] For overviews of the *Ikhwan al-Safāʾ* and their scientific encyclopedia, see Ian Richard Netton, *Allah Transcendent: Studies in the Structure and Semiotics of Islamic Philosophy, Theology, and Cosmology* (Surrey, England: Curzon Press, 1989), pp. 203–55; idem, *Muslim Neoplatonists: An Introduction to the Thought of the Brethren of Purity* (London: George Allen and Unwin, 1982); Seyyed Hossein Nasr, *An Introduction to Islamic Cosmological Doctrines,* revised edition (Albany: SUNY Press, 1993).

[50] Ian Richard Netton, "The Brethren of Purity (Ikhwan al-Safāʾ)," in Seyyed Hossein Nasr and Oliver Leaman, eds., *History of Islamic Philosophy* (London: Routledge, 2001 [1996]), 1: 222–30, on p. 224.

[51] William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* (Princeton: Princeton University Press, 1994), p. 41.

[52] See Shlomo Pines, "Shiite Terms and Conceptions in Judah Halevi's Kuzari," *Jerusalem Studies in Arabic and Islam* 2 (1980): 165–251. The Epistles of the *Ikhwan* were brought to Spain by Ḥamid al-Din Aḥmad b. Abdallah al-Kirmani (d. 1021), an older contemporary and a townsman of Solomon Ibn Gabirol, who was an active Ismaili missionary, operating especially in Iraq. For an exposition of al-Kirmani's metaphysics, see Netton, *Allah Transcendent*, pp. 222–9; Paul E. Walker, *Ḥamīd al-Dīn al-Kirmānī: Ismaili Thought in the Age of al-Ḥākim* (London: I. B. Tauris, 1999), esp. pp. 80–103. On the organization of Ismaili missionary activity, its messianic and subversive political posture, and its philosophical message, see Paul Walker, *Early Philosophical Shiism: The Ismaili Neoplatonism of Abu Yaʾqub al-Sijistani* (Cambridge: Cambridge University Press, 1993), pp. 6–16.

[53] Sarah Heller Wilensky, "The 'First Created Being' in Early Kabbalah: Philosophical and Ismailian Sources," *Binah* 3 (1994): 65–77. Heller Wilensky documented Ibn Latif's debt to Ibn Gabirol and his Muslim sources.

catalogues of the sciences, arranging scientific information in architectonic order and differentiating among types of sciences.[54] Educated Jews in Baghdad, Egypt, North Africa, and Muslim Spain – especially those employed in the service of the Muslim state as physicians, astrologers, astronomers, diplomats, and translators – culled their scientific knowledge from some of these sources as well.

The result was the growth of "philosophic spirituality," as Tzvi Langermann called it,[55] among the Jewish elite, especially in Muslim Spain. Jewish thinkers such as Solomon Ibn Gabirol (d. 1056) and Joseph Ibn Zaddik (d. 1149) composed scientific-philosophical treatises in Arabic for other like-minded intellectuals of their class. The most prolific Jewish scholar of this group, Abraham Ibn Ezra (d. 1166), applied his mastery of the sciences to the interpretation of Scripture and began spreading knowledge of the sciences among the Hebrew-reading Jews of Latin Europe.[56]

This intellectual elite and its philosophical spirituality became the target of Judah Halevi's critique in the *Kuzari*.[57] Although he was intimately familiar with contemporary philosophy and science, he did not think that they charted the path to God. Rather, intimacy with God could be achieved only through the particular rituals of the Jewish religion revealed by God to the Jewish people in the Torah. These rituals fit the particular make-up of Jews, body and soul, enabling them to experience God directly. The unique relationship between God and the Jewish people, which encompasses also those who convert to Judaism, like the king in the *Kuzari*, is mediated through the divine language, Hebrew.

Halevi's theory of the Hebrew language is based on the views of SY. In *Kuzari* 4:25 Halevi distinguishes the divine language from all other languages:

> But the divine language, which was created and which God taught to Adam and placed on his tongue in his heart, is without doubt the most perfect of all languages and most appropriate to what it designates, as it says "and whatever the man called every living creature, that was its name" (Gen. 2:19). This means that it is fit for that name and appropriate to it, and it indicates its nature. This argues for the excellence and advantage of [the Hebrew language].... This also applies to writing, for the shapes of its letters are not without meaning and accidental, but rather of a matter that is appropriate to what is intended by each and every letter.[58]

For Halevi, then, the Hebrew language is unlike all other languages, in which signs arbitrarily designate things; instead, it is a divine language whose words signify the essence or nature of created things. Halevi's ideas were derived from SY; Part IV of the *Kuzari* is a commentary on SY, which Halevi considered to be "one of the remnants of the natural sciences" once

54 For overviews of these scientific encyclopedias, see Hans Heinrich Biesterfeldt, "Medieval Arabic Encyclopedias of Science and Philosophy," in Steven Harvey, ed., *The Medieval Hebrew Encyclopedias of Science and Philosophy* (Dordrecht: Kluwer, 2000), pp. 77–98.

55 Y. Tzvi Langermann, "Science and the *Kuzari*," *Science in Context* 10 (1997): 99–134, on p. 501.

56 For an extensive analysis of Ibn Ezra's scientific oeuvre, see Shlomo Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden: Brill, 2003); idem, "Encyclopedic Aspects of Abraham Ibn Ezra's Scientific Corpus," in *Medieval Hebrew Encyclopedias*, pp. 154–70.

57 The Kuzari's critique of philosophy has been subject to diverse and conflicting interpretations, because Halevi both appreciated the achievements of the philosophers and disparaged philosophical speculation as such. See Barry Kogan, "Al-Ghazali and Halevi on Philosophy and the Philosophers," in John Inglis, ed., *Medieval Philosophy and the Classical Tradition in Islam, Judaism and Christianity* (New York: Routledge, 2002), pp. 64–80, on p. 75. Dov Schwartz has argued that Halevi presented a "systematic anti-rationalism" but that the rejection of philosophy belongs to the esoteric layer of the *Kuzari*, as part of a deeper claim about the impossibility of Jewish philosophy (*Contradiction and Concealment in Medieval Jewish Thought* [Ramat Gan: Bar-Ilan University Press, 2002], pp. 45–67 [Heb.]).

58 Judah Halevi, *Sefer ha-Kuzari*, trans. Judah Ibn Tibbon, ed. A. Zifroni (Warsaw, 1911). The English translation is by Marc Brian Sendor, "The Emergence of Provençal Kabbalah: Rabbi Isaac the Blind's 'Commentary on *Sefer Yezirah*,'" Ph.D. dissertation, Harvard University, 1994, p. 245.

prevalent among the Jews.[59] Unlike Abraham Ibn Ezra, who was committed to imparting the scientific knowledge of Greco-Arabic culture to his Jewish readers and claimed that the Bible itself attests that the ancient Israelites were versed in the "alien" sciences, Halevi maintained that Jews have no need to resort to contemporary natural philosophy or science because they possess an authentic tradition, exemplified by SY, whose explanatory power is superior to contemporary theories.[60] Halevi's conception of divine language, based on the teachings of SY, was endorsed by kabbalists. Like Halevi and other Jewish thinkers of the early twelfth century, the kabbalistic conception of the physical world resonated with Neoplatonic and Hermetic themes.

SEFER YEṢIRAH AS A FOUNDATIONAL TEXT OF KABBALAH

At the end of the twelfth century, SY was considered to be a foundational text of the Jewish mystical tradition, endorsed by the German Pietists (Ḥasidei Ashkenaz) and by kabbalists in Provence; during the thirteenth century in Spain, the kabbalists absorbed SY through the commentary by Donnolo and the translation of Saadia Gaon's commentary on SY and developed their systematic theory of the Hebrew language as the grammar of reality. R. Eleazar of Worms (fl. 1220) commented on SY; R. Elḥanan ben Yaqar (first half of the thirteenth century), who was active in London, composed two commentaries on the ancient text, drawing much of his material from the speculations of the anonymous circle of German Pietists known as the Circle of the Special Cherub.[61] The German Pietists approached SY as a set of instructions for the creation of a humanoid (a golem); their engagement with magic, based on SY, reversed the intent of Saadia Gaon's commentary on that work. This magical praxis was part of a larger conception of nature as a linguistic product that manifests an internal structural harmony. In other words, their magical practices were rooted in their linguistic conception of nature, derived from SY.

Similarly, the early kabbalists in Provence, beginning with Isaac Sagi-nahor ("The Blind"; 1165–1235), were preoccupied with SY. Isaac was the first Jewish scholar to compose kabbalistic texts exclusively, the first to systematize kabbalistic doctrines in writing, and the first to write a kabbalistic commentary on SY. Although his thought has certain motifs in common with the mysticism of the German Pietists (or at least addresses them), it also "exhibits a continuity with Judeo-Arabic philosophy of the previous generation."[62] Isaac made extensive use of the commentaries on SY by Saadia Gaon, Shabbetai Donnolo, and Judah ben Barzillai al-Bargeloni (fl. mid-twelfth century).[63] "A rudimentary kabbalistic system which

59 *Kuzari* IV, 24.

60 Halevi's polemics notwithstanding, he could not extricate himself from the philosophic and scientific vocabulary of his day. When interpreting the key terms of SY – *sefer*, *sefar*, and *sippur* – he employed Aristotelian philosophical categories about the unity of the knower, the known object, and the act of knowing. See Jospe, "Early Philosophical Commentaries," pp. 396–7.

61 See Joseph Dan, *The Esoteric Theology of Ashkenazi Hasidism* (Jerusalem: Bialik Institute, 1968), pp. 59–60 (Heb.).

62 Sendor, "The Emergence of Provençal Kabbalah," p. 19.

63 For an overview of this text see Joseph Dan, "Peruš Sefer Yeṣirah le-R. Yehudah ben Barzillai ha-Barceloni," in Michal Oron and Amos Goldreich, eds., *Maśśu'ot: Studies in Kabbalistic Literature and Jewish Philosophy in Memory of Prof. Ephraim Gottlieb* (Jerusalem: Bialik Institute, 1994), pp. 99–119. Dan shows that the main goal of this text was to reconcile the differences between the cosmogony of SY and that of Genesis and rabbinic midrashim. This task was made urgent by the linguistic shift from Arabic to Hebrew. In the East, where Saadia wrote his commentary on SY in Arabic, the need was less pressing, but in the West, where the commentaries were composed in Hebrew, the differences between the biblical text and SY required a commentary. Sendor ("The Emergence of Provençal Kabbalah," pp. 255–61) insightfully situates the kabbalistic commentary on SY in the context of the diffusion of Hermeticism in the Latin West in the eleventh century and the Neoplatonic framework of the Cathedral schools in the twelfth century. Although he perceptively suggests similarities between the kabbalistic commentary and Iamblichus's Neoplatonic theurgy (p. 270), more work is needed to explore the implications of this connection for the relationship between kabbalah and science.

included the fusion of a set of divine attributes with the *sefirot* of *Sefer Yesirah*, multiple epithets for those *sefirot*, the association of a tradition of divine Names with the *sefirot*, the kabbalist interpretation of aggadic motifs, a mysticism of prayer and some structural and temporal grouping and differentiation with the set of Sefirot" emerged from his own creative process of interpretation.[64] For the kabbalists, theosophic knowledge of the sefirot – the dynamic powers within the deity – made kabbalah epistemically superior to Aristotelian science.

Throughout the thirteenth century, kabbalistic speculation about the origin of the universe was elaborated through commentaries on SY, even while rationalist Aristotelian philosophers no longer paid attention to the text, because they had adopted a different scientific schema. Isaac Sagi-nahor's commentary on SY, which was closely related to his commentary on the biblical creation narrative, paved the way for other kabbalistic commentaries. The kabbalists of the thirteenth and early fourteenth centuries who wrote commentaries on SY included Ezra ben Solomon of Gerona (fl. 1220),[65] Azriel of Gerona (fl. 1230),[66] Naḥmanides (d. 1270),[67] Baruch Togarmi (fl. 1260),[68] Jacob ben Jacob Hakohen (fl. 1260),[69] Abraham Abulafia (d. ca. 1293),[70] Joseph Gikatilla (d. ca. 1322),[71] Isaac of Acre (d. 1310),[72] Joseph ben Shalom Ashkenazi (d. ca. 1358),[73] and Joseph Ibn Waqar (fl. 1340).[74] They all viewed the ancient text as the key to the correct understanding of nature and the biblical creation narrative; its idiosyncratic language became fixed phraseology in their works and was believed to contain deep mystical content. Even the Zohar could be viewed as an elaboration of the linguistic doctrines of SY, although it was not a commentary on SY.[75] Despite the differences in their views, all these kabbalists shared the assumption that the physical world is composed of letters and numbers and that "language – and, in particular, liturgical language – is the medium by which one can again participate in the creative process of uniting cosmic forces, the act of *ma᾽aseh merkavah*."[76]

64 Sendor, "The Emergence of Provençal Kabbalah," p. 36.

65 The commentary by Ezra Gerondi is cited by Abraham Abulafia, but is no longer extant.

66 The commentary by Azriel Gerondi was erroneously attributed to Nahmanides and printed under his name.

67 Nahmanides' commentary on SY was published by Gershom Scholem, "Be᾽ur Ma῾aśeh Berešit be-derekh qabbalah mi-ysod ha-Ramban," *Qiryat Sefer* 6 (1950): 415–17.

68 Practically nothing is known about the life of Baruch Togarmi, except that he was a teacher of Abraham Abulafia. Whether the meeting between them took place in Italy, the Near East, or Spain remains unclear. Togarmi's commentary on SY is discussed later.

69 See Daniel Abrams, "In the Footsteps of the Lost Commentary on *Sefer Yeṣirah* by R. Jacob ben Jacob Cohen: An Edition of a Commentary of *Sefer Yeṣirah* on the Basis of the Earliest Kabbalistic Manuscripts," *Kabbalah: Journal for the Study of Jewish Mystical Texts* 2 (1997): 31–342 (Heb.).

70 Abulafia testifies that he was familiar with twelve commentaries on SY and composed three commentaries of his own. See Moshe Idel, "Abulafia's Secrets of the *Guide*: A Linguistic Turn," *Revue de Métaphysique et de Morale* 4 (1998): 495–528, on p. 517.

71 Gikatilla did not compose a linear commentary on SY, but his earlier work, *Ginnat ᾽egoz*, was an elaboration of the letter and number symbolism of SY. The point is elaborated later.

72 The first chapter of Isaac of Acre's commentary on SY was published by Gershom Scholem in *Qiryat Sefer* 32 (1955/6).

73 Joseph Shalom Ashkenazi's commentary on SY was embedded in his commentary on Genesis Rabbah. For a critical edition, see Moshe Hallamish, ed., *A Kabbalistic Commentary of Rabbi Yoseph ben Shalom Ashkenazi on Genesis Rabbah* (Jerusalem: Magnes Press, 1984) (Heb.).

74 Joseph Ibn Waqar's commentary on SY has not survived, but there are references to it in MS Vatican 203 ff. 183^{v}–184^{r}. See Georges Vajda, "On Joseph Ibn Waqar's Commentary on *Sefer Yeṣirah*," *᾽Oṣar Yehudei Sefarad: Le-ḥeqer toledot yehudei Sefarad ve-tarbutam* 5 (1962): 17–20 (Heb.). Although the extant text of Ibn Waqar's commentary is in Judeo-Arabic, it is not known whether he wrote it in Hebrew or in Arabic.

75 Liebes, *Ars Poetica*, pp. 49–52.

76 Eliot R. Wolfson, "Letter Symbolism and Merkavah Imagery in the Zohar," in *Alei Shefer: Studies in the Literature of Jewish Thought Presented to Rabbi Dr. Alexander Safran* (Ramat Gan: Bar-Ilan University Press, 1990), pp. 195–236, on p. 221.

Most relevant to our topic are the kabbalists – Baruch Togarmi, Isaac Ibn Latif (d. ca. 1280), Joseph Gikatilla, Moses de Leon (d. 1305), and Abraham Abulafia – who were interested in SY but who were also ardent students of Maimonides' *Guide of the Perplexed.* The precise relationships among these kabbalists is not easy to ascertain and has been the subject of much scholarly debate,[77] but there are strong arguments in support of the claim that they "were acquainted with each other's writings and knew each other personally."[78] The oldest member of the group, Baruch Togarmi, was Abulafia's teacher. It was probably Abulafia who introduced the younger Joseph Gikatilla to his teacher and to the study of SY. Togarmi's *Mafteḥot ha-qabbalah,* a commentary on SY, deeply influenced Gikatilla's *Ginnat ʾegoz,* whose title refers to the methods of letter permutations by which kabbalists allegedly decipher the mysteries of nature.[79] Although *Ginnat ʾegoz* was not a linear commentary on SY, it adhered to the structure of the ancient text and showed how its linguistic theories were compatible with medieval cosmology. *Ginnat ʾegoz* attests to its author's familiarity with the technical terminology of Isaac Ibn Latif, another Jewish intellectual who was intimately familiar with SY and with the *Guide* and whose worldview was deeply indebted to Ismaili cosmology. *Ginnat ʾegoz* contributed in turn to the early works of Abraham Abulafia, who says that he consulted twelve commentaries on SY, as well as the pre-Zoharic writings of Moses de Leon, such as *Or zaruaʿ*, as the basis for his own three commentaries on the ancient text.[80]

This group's preoccupation with SY is relevant to our attempt to understand the relationship between Aristotelian science and kabbalah as competing approaches to the study of nature, because these kabbalists also studied the *Guide* during the 1260s and 1270s.[81] I believe that their dual engagement was no coincidence, because the *Guide* and SY reflected two alternative paths to decoding the esoteric meaning of Scripture with regard to the physical world (i.e., *maʿaśeh berešit*) and the intelligible world (i.e., *maʿaśeh merkavah*). After 1279, when they finally mastered these two alternatives, Moses de Leon and Joseph Gikatilla moved beyond "philosophical kabbalah" to compose a full-fledged symbolic theosophy that gave rise to the classics of kabbalah – the Zohar and *Shaʿarei ʾorah,* respectively – and Abraham Abulafia spelled out his prophetic kabbalah.[82] Despite the different orientations of theosophic kabbalah and prophetic kabbalah in the mature writings of these kabbalists,[83] the two types of kabbalah shared the assumption that the physical world is composed of letters and numbers. This linguistic theory, which originated in SY, is crucial to our attempt to understand how kabbalah affected the involvement of Jews in the natural sciences during the Late Middle Ages. I return to it in the chapter's concluding remarks.

77 On the relationship among these kabbalists, see Shlomo Blickstein, "Between Philosophy and Mysticism: A Study of the Philosophical-Qabbalistic Writings of Joseph Giqatila (1248–c. 1322)," Ph.D. dissertation, Jewish Theological Seminary of America, 1983, p. 113 and the diagram in p. 176.

78 Ibid., p. 122.

79 This text influenced both Abraham Abulafia and Moshe de Leon, who engaged in the intensive study of the *Guide* in the 1260s. See Blickstein, "Between Philosophy and Mysticism," pp. 109–23.

80 On *ʾOr zaruaʿ* by Moses de Leon, see Alexander Altmann, "Moses de Leon's *ʿOr Zaruaʿ*: Introduction, Critical Text, and Notes," *Koveṣ ʿal yad* n.s. 9 (1979): 217–93 (Heb.).

81 See Moshe Idel, "Maimonides and Kabbalah," in Isadore Twersky, ed., *Studies in Maimonides* (Cambridge, MA: Harvard University Press, 1991), pp. 31–79; idem, "Maimonides' *Guide of the Perplexed* and the Kabbalah," *Jewish History* 18 (2004): 197–226.

82 On the beginning of Abulafia's prophetic kabbalah, see Moshe Idel, *Studies in Ecstatic Kabbalah* (Albany: SUNY Press, 1988), pp. 91–3. Idel offers the plausible suggestion that Abulafia's prophetic kabbalah reflects the impact of Eastern Sufism.

83 For further exposition see Hava Tirosh-Samuelson, "Philosophy and Kabbalah: 1200–1600," in Daniel H. Frank and Oliver Leaman, eds., *The Cambridge Companion to Medieval Jewish Philosophy* (Cambridge: Cambridge University Press, 2003), pp. 218–57.

On the whole, kabbalists paid attention to SY not to wrest it away from the philosophers, as Langermann implied,[84] but because kabbalists regarded SY's linguistic ontology and cosmic semiotics as the "divine science" par excellence, namely, metaphysics properly understood. This knowledge of God cannot be discovered by human reason on the basis of empirical knowledge of God's created world; it can only be revealed by God and received from an authoritative teacher who transmits the sacred living tradition. The continued interest in SY among kabbalists and the decline of philosophical attention to the text reflect the larger change in the intellectual climate during the second half of the twelfth century. As a result of that change, kabbalah presented itself as an abstract, theoretical, speculative discourse that *explains* the first principles of the universe – the sefirot and the Hebrew letters – and enables the knower to attain personal immortality. This esoteric salvific knowledge was in conflict with salvific knowledge as understood by Aristotelian philosophers, who identified it with the "acquired intellect." A closer look at the dialectical relationship between Aristotelianism and kabbalah during the thirteenth century will shed light on the emergence of the new paradigm in Jewish thought that was to coexist with and in fact rival Aristotelianism. I examine this relationship from the perspectives of both history and theory: Historically, kabbalah emerged as a self-conscious program for the interpretation of Judaism at roughly the same time that Maimonides promoted Aristotelian science as the only explanation of the physical world.[85] As a matter of theory, kabbalah saw itself as an alternative to Maimonidean philosophy because it viewed itself as a distinctive and superior form of science.

KABBALAH AS AN ALTERNATIVE TO MAIMONIDEAN PHILOSOPHY

Maimonides' Promulgation of Aristotelianism: The Paradigm Shift in Jewish Philosophy

I have already noted that Abraham Ibn Daud endorsed Aristotelian natural philosophy as the correct scientific theory in the 1160s. His vehement critique of Solomon Ibn Gabirol, which exposed the mistakes in Ibn Gabirol's interpretation of the doctrine of hylomorphism and the internal inconsistencies of his metaphysics, is evidence of the vigor of the paradigm shift then underway.[86] Yet it was Maimonides, not Ibn Daud, who effected the transformation of Jewish culture in the thirteenth century.[87] Maimonides considered Aristotle's science

[84] Langermann, "Science and the *Kuzari*," p. 508.

[85] Even though I discuss the endorsement of Aristotelianism by Abraham ibn Daud and Maimonides as a paradigm shift in Jewish intellectual history, it is well known that medieval Jewish Aristotelianism from its inception was suffused with Neoplatonic elements, and, conversely, that Jewish Neoplatonism in the eleventh and twelfth centuries made use of Aristotelian categories and concepts.

[86] On Ibn Daud's critique, see Amirah Eran, *From Simple Faith to Sublime Faith: Ibn Daud's Pre-Maimonidean Thought* (Tel Aviv: Hakibbutz Hameuchad, 1998), pp. 76–108 (Heb.). Ibn Daud's critique was indebted to Ibn Sina; see Norbert Samuelson and Gershon Weiss, trans. and eds., *The Exalted Faith: Abraham Ibn Daud* (London: Associated University Presses, 1986), p. 59. Modern scholars, too, have commented on the lack of consistency in Ibn Gabirol's philosophy, correctly observed by Ibn Daud, but offer differing interpretations of it. Liebes suggested that Ibn Gabirol's philosophical work was a cumbersome and not entirely successful formulation of his mythic-religious outlook, indebted to SY. Dov Schwartz, by contrast, took the inconsistencies to be the result of deliberate obfuscation, possibly establishing Gabirol's work as an esoteric text (Schwartz, *Contradiction and Concealment*, pp. 39, 43). Ibn Gabirol's philosophy can be evaluated more positively if it is studied in the context of Ismaili philosophy and the "Pseudo-Empedoclean" literary tradition. For an assessment of "Pseudo-Empedocles" in the Arab world, see Daniel de Smet, *Empedocles Arabus: Une lecture néoplatonicienne tardive* (Brussels: Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten, 1998). I thank Prof. Aaron Hughes for directing me to this source.

[87] The irony of this situation is quite intriguing. Ibn Daud was committed to raising the scientific level of his coreligionists and taught his views openly and straightforwardly, but they made little impact. Maimonides, who deliberately obfuscated his scientific and philosophical views, effected the deepest cultural transformation of Judaism.

to be absolutely true as far as the sublunar, physical universe is concerned. Because the Bible, too, was true, the revealed text and Aristotelian philosophy-science could not be in conflict. Therefore, any apparent contradiction must be due either to a misunderstanding of Aristotelian science or to a misinterpretation of Scripture.

Maimonides was fully aware that the adoption of Aristotelian science by Jews would displace their prevailing approaches to the natural world, but he regarded this step as necessary because some of the prevailing theories were simply untrue. As he wrote in the introduction to the *Guide*,

> But those who are confused and whose brains have been polluted by false opinions and misleading ways deemed by them to be true sciences, and who hold themselves to be men of speculation without having any knowledge of anything that can truly be called science, those will flee from many of its [the *Guide*'s] chapters.[88]

Although Maimonides did not name the victims of this confusion and brain pollution, it seems reasonable to assume that he had in mind scholars such as Ibn Gabirol, Abraham Ibn Ezra, Moses Ibn Ezra, Judah Halevi, and Abraham Bar Ḥiyya, whose cosmological theories blended Neoplatonic, Hermetic, and Aristotelian elements and who took astrology to be a valid science. Precisely those theories that Maimonides discarded as unscientific and untrue were preserved and further elaborated in kabbalah as the deeper meaning of the Jewish esoteric tradition.

Maimonides' endorsement of Aristotelian science affected his approach to the Jewish esoteric tradition. He openly discredited the *Shiʿur Qomah* tradition as a "Jewish Byzantine forgery" and ignored texts such as the *Baraita de Maʿaśeh Berešit* or *Maʿaśeh Merkavah,* mentioned in the Talmud and interpreted by the Hekhalot and Merkabah corpus.[89] Maimonides also denied SY any scientific validity and rejected its linguistic ontology; he held that the universe is not constructed from the letters of the Hebrew alphabet, given that all languages, including Hebrew, are a human convention. Furthermore, Maimonides launched a frontal assault on the highly esteemed science of astrology,[90] denouncing the practice of magic and talismanic techniques associated with it as idolatry and portraying the Sabians, the major contributors to the perception of astrology as a science in early Islam, as arch-idolaters from whom Abraham dissociated himself when he promoted the monotheistic faith.[91]

Most importantly, Maimonides claimed that the inner meanings of Scripture (*sitrei torah*), which the rabbinic tradition designated as *maʿaśeh berešit* and *maʿaśeh merkavah*, are identical with Aristotelian physics and metaphysics, respectively.[92] This claim had important ramifications. First, it established Aristotelian science-philosophy as the only true and valid

88 *Guide of the Perplexed*, trans. Shlomo Pines (Chicago: University of Chicago Press, 1963), p. 16.

89 See Idel, "Maimonides and the Kabbalah," p. 34.

90 See Y. Tzvi Langermann, "Maimonides' Repudiation of Astrology," *Maimonidean Studies* 2 (1991): 123–58; Gad Freudenthal, "Maimonides' Stance on Astrology in Context: Cosmology, Physics, Medicine and Providence," in Fred Rosner and Samuel S. Kottek, eds., *Moses Maimonides: Physician, Scientist and Philosopher* (Northvale, NJ: Jason Aronson, 1993), pp. 77–90 and 244–9. Freudenthal argues that Maimonides' "true views of astrology were less negative than he professed" (p. 86).

91 The precise identity of the Sabians has been a subject of intense scholarly disputes. Some identified them as Mandeans, others as a Gnostic group or as exponents of Hermeticism. Maimonides constructed his own portrait of the Sabians on the basis of various Islamic historical sources. See Sara Stroumsa, "The Sabians of Haran and the Sabians in Maimonides: On the Development of Religion According to Maimonides," *Sefunot* 7 (1992): 277–95 (Heb.); idem, "Sabéens de Harran et Sabéens de Maïmonide," in Tony Lévy and Roshdi Rashed, eds., *Maïmonide: philosophe et savant* (Louvain: Peeters, 2004), pp. 335–52. I thank Prof. Zev Harvey for this reference.

92 Mishneh Torah, *Hilkhot Yesodei ha-Torah* 4:2. We should note, however, that Maimonides defined *maʿaśeh merkavah* rather broadly to include not only cosmology and psychology, which Aristotle included in physics, but also the immortality of the soul, thereby going beyond Aristotle's understanding of physics and reflecting the impact of Avicenna.

theory, privileging it over other scientific theories that circulated among Jews. Second, if, as Maimonides insisted, the inner meaning of Scripture should be interpreted in light of Aristotelian physics and metaphysics, only a person trained in Aristotelian physics and metaphysics could properly understand it. Third, the curriculum of Jewish education had to change to include the study of science and philosophy in addition to Jewish religious texts. Finally, non-Jews could in principle have access to the inner meaning of Torah, provided they had reached a high level of intellectual perfection. In the absence of a proper philosophical-scientific understanding, being born a Jew or observing Jewish religious law cannot yield the proper knowledge of Scripture necessary for religious perfection. Whereas the first two ramifications conflicted with views common among Jewish intellectuals in the twelfth century, the last two claims negated the views of those Jewish scholars who regarded themselves as guardians of the received, authentic, oral tradition – kabbalah, broadly defined.

Kabbalah as a Response to Maimonides' Philosophy

That kabbalah emerged as a cultural movement to stem the spread of Maimonidean rationalism is an old claim. It was the cornerstone of Heinrich Graetz's reconstruction of the conflict between the enlightened rationalism of the philosophers and the embarrassing, superstitious obscurantism of the kabbalists. Graetz's view was rejected by Gershom Scholem, who posited instead that kabbalah emerged as a fusion of Jewish Gnosticism and Neoplatonism,[93] but it has been rehabilitated and substantiated by Moshe Idel. According to Graetz, as summarized by Idel, "it was philosophy in general, and Maimonidean philosophy in particular, which set in motion the most important process which generated the Kabbalah."[94] Idel concurs with this assessment when he concludes that "it was mostly the philosophical interpretation of ancient Jewish esoteric matters which produced the opposition of some Jewish authorities."[95]

I share this evaluation, while also endorsing Elliot Wolfson's observation that we must not consider Maimonides "simply a negative catalyst in the evolution of Jewish mysticism in thirteenth-century Spain."[96] Idel, too, would agree with this judgment, given that he has shown how kabbalists like Abraham Abulafia, Moses de Leon, Isaac Ibn Latif, and Joseph Gikatilla wrote commentaries on SY but also studied Maimonides' *Guide*.[97] Abulafia composed three commentaries on the *Guide;* his own prophetic kabbalah was inseparable from Aristotelian cosmology and epistemology. Some kabbalists paid close attention to the *Guide* (their major but not exclusive source of Aristotelian science), because they correctly grasped the implications of Maimonides' revolutionary hermeneutics. If Aristotle's natural philosophy constituted the inner meaning of *maʿaśeh berešit* and *maʿaśeh merkavah,* then the kabbalistic interpretations of these subjects were seriously challenged. Conversely, if kabbalah was correct about God and the universe, then there were three possibilities: Aristotelian natural philosophy stated the truths of kabbalah in a different vocabulary, or it was mistaken about the "facts" (be they the facts of nature or the facts of Scripture), or it was partially valid and needed to be supplemented by the higher truths of kabbalah. Kabbalists in the thirteenth century employed all three interpretive strategies.[98] Because of their authors'

93 See Idel, "Maimonides and the Kabbalah," p. 32.

94 Ibid., p. 33.

95 Ibid.

96 Eliot R. Wolfson, "Beyond the Spoken Word: Oral Tradition and Written Transmission in Medieval Jewish Mysticism," in Yaakov Elman and Israel Gershoni, eds., *Transmitting Jewish Traditions: Orality, Textuality and Cultural Diffusion* (New Haven: Yale University Press, 2000), pp. 166–224, on p. 187.

97 See Idel, "Maimonides' *Guide of the Perplexed* and the Kabbalah."

98 These strategies are examined more closely by Boaz Huss, "Mysticism versus Philosophy in Kabbalistic Literature," *Micrologus: natura, scienze e società medievali* 9 (2001): 125–35.

engagement with Maimonides, kabbalistic texts of the second half of the thirteenth century were replete with references to Aristotelian natural philosophy, while at the same time showing its limitations.[99] We can go even further and say that the presentation of kabbalah as an alternative to Aristotelian natural philosophy was inextricably linked to the *rate* at which Aristotelian natural philosophy spread among the Jews. This claim becomes clearer if we look at the sequence of key events in the thirteenth century.

Maimonides' *Guide* was written by 1190. It was translated into Hebrew by Samuel Ibn Tibbon in 1204, because Jewish intellectuals in Provence had no knowledge of Arabic. Thus the adoption of Aristotelian science among the Jews went hand in hand with the linguistic and demographic changes that ensued after the conquest of Andalusia by the Almohads in 1148–50. The first translation of Aristotle into Hebrew followed soon thereafter, in 1210, when Ibn Tibbon translated Aristotle's *Meteorology* under the title *Sefer Otot ha-shamayim*.[100] It is well known that the choice of text was no coincidence; it was dictated by Maimonides' claim in *Guide* II, 30 that Aristotle's *Meteorology* provided the semantic key for the interpretation of Genesis.[101] To understand Genesis properly, a scientifically inclined Jewish reader had to have access to the *Meteorology*. Between 1221 and 1231, Ibn Tibbon composed *Ma'amar yiqqawu ha-mayim* (a title derived from Gen. 1:9: "Let the waters under the heaven be gathered together unto one place"), in which he showed Jewish readers how to apply Aristotle's physical theories to the details of the biblical text. Thus, the biblical account of creation, correctly interpreted, could be shown to be identical with the naturalistic account based on Aristotle's science.[102]

Kabbalists could not ignore Ibn Tibbon's interpretations of the biblical account of creation, because by 1230 they already had in place a reading of *maʿaśeh berešit* based on SY, which it challenged. This textual tradition, as noted earlier, began with Isaac Sagi-nahor, who composed commentaries on both SY and Genesis.[103] Isaac's interpretations of the biblical creation narrative were transmitted to the kabbalists of Catalonia orally and in writing, resulting in several versions of kabbalistic commentaries on Genesis.[104] The longest variant of Isaac's commentary on Genesis was incorporated into Ezra ben Solomon's commentary on talmudic aggadot; Ezra also composed his own commentary on the account of creation

99 A similar development in Islam is exemplified by Ibn Arabi (1165–1240), who was influenced by the terminology of the Jewish Neoplatonists and influenced kabbalists, including the Zohar. On the link between Ibn Arabi and kabbalah, see Ronald Kiener, "Ibn al-Arabi and the Qabbalah: A Study of Thirteenth-Century Iberian Mysticism," *Studies in Mystical Literature* 2(2) (1982): 26–52. For a broader reflection of the issues involved, see David Ariel, "'The Eastern Dawn of Wisdom': The Problem of the Relations between Islamic and Jewish Mysticism," Vol. 2, in David Blumenthal, ed., *Approaches to Judaism in Medieval Times* (Chico, CA: Scholars Press, 1984), pp. 149–67.

100 See Resianne Fontaine, ed. and trans., *Otot Ha-Shamayim: Samuel Ibn Tibbon's Hebrew Version of Aristotle's Meteorology* (Leiden: Brill, 1995).

101 For a detailed explanation of Maimonides' use of Aristotle's *Meteorology*, see Sara Klein-Braslavy, *Maimonides' Interpretation of the Story of Creation* (Jerusalem: Reuben Mass, 1987) (Heb.).

102 For a close reading of Samuel Ibn Tibbon's reading of Maimonides and of Genesis on the basis of Aristotle's *Meteorologica*, see Aviezer Ravitzky, "Aristotle's *Meteorology* and the Maimonidean Modes of Interpreting the Account of Creation," *Aleph: Historical Studies in Science and Judaism* 8 (2008): 361–400, first published in Hebrew, *Jerusalem of Jewish Thought* 9 (1990): 225–50; Georges Vajda, *Recherches sur la philosophie et la kabbale dans la pensée juive du Moyen Age* (Paris: Mouton, 1962), pp. 13–31; idem, "An Analysis of the *Ma'amar Yiqqawu ha-Mayim* by Samuel b. Judah Ibn Tibbon," *Journal of Jewish Studies* 10 (1959): 137–49.

103 On Isaac Sagi-nahor's commentary on Genesis and its use by later kabbalists, see Daniel Abrams, *R. Asher ben David: Complete Works and Studies in his Kabbalistic Thought* (Los Angeles: Cherub Press, 1996), p. 302 (Heb.).

104 Although Isaac Sagi-nahor was the first to commit kabbalistic doctrines to writing, he was concerned that the dissemination of kabbalah would jeopardize its esoteric nature. For an overview of the interdependence of orality and esotericism in the history of kabbalah, see Wolfson, "Beyond the Spoken Word," pp. 170–89. Wolfson's suggestion that the kabbalists were influenced by Maimonides' conception of *sitrei torah,* expressed parabolically in the biblical and rabbinic texts, supports the view of the relationship between kabbalah and Maimonideanism as dialectical.

in Genesis, which he incorporated into his commentary on the Song of Songs.[105] Moshe Halbertal suggested very plausibly that Ezra ben Solomon focused on Genesis, along with Psalms 74 and 104, because he was familiar with *Maʾamar Yiqqawu ha-mayim* and wanted to rebut Ibn Tibbon's Aristotelian exposition of Scripture.[106] In essence, Ezra (along with other Gerona kabbalists) held that the events described in the first chapters of Genesis relate primarily to the emanation of the sefirot from the *Ein Sof* rather than to the physical processes of the atmosphere, as Ibn Tibbon claimed. The world we know through the senses (and which Aristotelian physics explained scientifically) is only a reflection of events that take place within God, which cannot be known empirically.

What Ezra ben Solomon taught privately to like-minded kabbalists became public polemics in the hand of Jacob ben Sheshet, another member of this kabbalistic circle in Gerona. Jacob lashed out at Ibn Tibbon's interpretation of the creation narratives in Genesis and Psalms, accusing the philosopher-translator not only of misunderstanding Scripture but also of willfully and viciously ascribing his own heretical views (e.g., that the world is eternal and that providence is universal, not particular) to Maimonides. Later, I examine the specifics of Jacob's critique more closely. For now suffice it to say that to support his claims against Ibn Tibbon, he relied on Ezra's commentary on *maʿaśeh berešit* and another variant of this exegetical tradition, which circulated under the name of Joseph ben Samuel (and which Jacob incorporated verbatim into his *Meshiv devarim nek̲oḥim*). Other kabbalistic interpretations of Genesis were preserved by the anonymous author of *Maʿarekhet ha-ʾelohut,* by Isaac of Acre in *Sefer Meʾirat ʿeinayim,* and by Joshua Ibn Shuaib in his commentary on the Pentateuch.[107] Note that these three kabbalists were associated with Nahmanides, the leader of Catalonian Jewry, who played a crucial role in the Maimonidean controversy. Thus, when Jacob ben Sheshet criticized Ibn Tibbon's scientific interpretation of the biblical creation narrative, he did so in the name of an existing kabbalistic tradition about *maʿaśeh berešit* that was prevalent among the kabbalists of Catalonia, chief among whom was Nahmanides.

A Kabbalistic Esoteric Philosophy of Nature

During the Maimonidean controversy of the 1230s, Nahmanides was less polemical than Jacob ben Sheshet.[108] Nahmanides attempted to negotiate a settlement between the feuding camps and composed his own linear commentary on the Torah to demonstrate that philosophy and science could coexist with kabbalah. Langermann correctly stated that Nahmanides "was not an enemy of science" but that his posture was one of "acceptance and devaluation of science."[109] When the evidence for a given scientific theory is indisputable

[105] See Seth Brody, ed. and trans., *Rabbi Ezra ben Solomon of Gerona: Commentary on the Song of Songs and Other Kabbalistic Commentaries* (Kalamazoo: Medieval Institute Publications, 1999).

[106] See Moshe Halbertal, "R. Menachem ha-Meiri: Between Torah and Wisdom," *Tarbiz* 63 (1994): 97 n. 67 (Heb.).

[107] On the various kabbalistic commentaries on Genesis, see Ephraim Gottlieb, "Le-Mašmaʿutam u-megamatam šel 'perušei maʿaśeh berešit' be-reʾšit ha-qabbalah" (On the Meaning and Orientation of Commentaries on Genesis in Early Kabbalah), in Joseph Hacker, ed., *Studies in the Kabbalah Literature* (Tel Aviv: Tel Aviv University, 1976), pp. 59–87; Abrams, *R. Asher ben David*, pp. 301–6.

[108] For an analysis of Nahmanides' posture during the Maimonidean debate of the 1230s, see David Berger, "How Did Nahmanides Propose to Resolve the Maimonidean Controversy," in Ezra Fleischer et al., eds., *Meʾah Sheʿarim: Studies in Medieval Jewish Spiritual Life in Memory of Isadore Twersky* (Jerusalem: Magnes Press, 2001), pp. 135–46. Berger shows that Nahmanides urged a lifting of the ban on the private and public study of *Sefer ha-Maddaʿ* and the *Guide*, even though he also maintained that "a ban on group study of the *Guide* should be instituted and that . . . the study of philosophy should be entirely discouraged, but gently and without a ban" (p. 145).

[109] Y. Tzvi Langermann, "Acceptance and Devaluation: Nahmanides' Attitude towards Science," *Jewish Thought and Philosophy* 1 (1992): 223–45, on p. 231. The essay was reprinted in his *The Jews and the Sciences in the Middle Ages* (Aldershot: Ashgate/Variorum, 1999), ch. 5.

(e.g., the scientific explanation of the rainbow), he was compelled to accept Greek science.[110] For Nahmanides, the tension between Aristotelian natural philosophy and kabbalah could be resolved by viewing them as parts of a hierarchy of knowledge originating in the divine, primordial Torah, which functions as the blueprint of the universe. To properly understand the literal meaning of the revealed Torah, one must employ philosophy and its related natural sciences; however, the deep, esoteric meaning of the primordial Torah can be deciphered only through kabbalah, the esoteric "path of truth" (*derek ha-ʾemet*).[111]

The allusions to the esoteric teachings of kabbalah in a commentary intended for all Jews did not violate Nahmanides' commitment to esotericism. Nahmanides transmitted kabbalistic doctrines to his immediate disciples (including Solomon Ibn Adret, Baḥya ben Asher, Isaac Todros, David ha-Kohen, and Sheshet Gerondi), but in his public commentary, he merely alluded to or hinted at certain kabbalistic views without explicating them. A full explication of Nahmanides' kabbalistic teachings had to wait until after his death in 1270 and for students of Solomon Ibn Adret's, such as Shem-Ṭov Ibn Gaon (fl. 1300).[112]

When Nahmanides' legacy is studied comprehensively, with reference to both his biblical commentaries and kabbalistic works, it becomes clear that his philosophy of Judaism incorporates a non-Aristotelian philosophy of nature.[113] In contrast to Maimonides, Nahmanides considered magic to be a valid scientific theory and technique used to manipulate the occult properties of natural things. Nahmanides restored books that Maimonides labeled idolatrous – such as *Ḥokhmataʾ de-shelomoh* and *ʿAvodah miṣrit* – to a place of honor in the Jewish curriculum. Similarly, whereas Maimonides denounced astrology, Nahmanides wrote a responsum that "it is permissible to listen to astrologers and believe them."[114] Nahmanides also interpreted the stability and regularity of the natural world differently than did Maimonides. The regularity of the natural world does not manifest the operation of immanent

[110] See Nahmanides' commentary on Genesis 9:12: "We must, against our will (*ʿal korkenu*), believe what the Greeks say, [viz.] that the rainbow is a natural effect (*toladah*) of the sun's shining upon the damp air, for one sees the likeness of a rainbow in a vessel of water that [is placed] before the sun" (trans. Langermann, "Acceptance and Devaluation," p. 233). In general, the phenomenon of the rainbow in particular and optics in general were of great interest to Muslim scientists, especially the *Ikhwan al Safa'* and their contemporary, Ibn al-Haytham (d. 1039), who worked in Cairo, which was the capital of the Ismaili Fatimids. See Alessandro Bausani, "Scientific Elements in Ismaili Thought: The Epistles of the Brethren of Purity," in Seyyed Hossein Nasr, ed., *Ismaili Contributions to Islamic Culture* (Teheran: Imperial Iranian Academy of Philosophy, 1977), pp. 123–40. Nahmanides' description of the rainbow is remarkably close to the views of the *Ikhwan* in the *Epistles* II, 4, according to which the rainbow "is created in the sphere of *nasim* [the atmosphere near the earth], when the air is humid, and stands always in an erect [*muntasib*] position, with the highest point of the bow grazing the sphere of *zamharir* [the cold zone between the *nasim* and the fiery ether]" (Bausani, "Scientific Elements," p. 127). Nahmanides apparently knew Arabic and could have had access to the teachings of the *Ikhwan*, which, as noted earlier, were available in Spain. See Raphael Jospe, "Nahmanides and Arabic," *Tarbiz* 57 (1988): 67–93 (Heb.). The rainbow was an important kabbalistic symbol of the last sefirah, malkhut, but whether this symbolic structure was affected by prevalent scientific theories about the rainbow requires a separate study.

[111] For a detailed analysis of Nahmanides' understanding of kabbalah, see Elliot R. Wolfson, "By Way of Truth: Aspects of Nahmanides' Kabbalistic Hermeneutic," *AJS Review* 14 (1989): 103–78. The gist of this lengthy and detailed essay is that Nahmanides' kabbalistic biblical exegesis involved creative imagination and not only the transmission of an existing, self-contained body of esoteric teachings, as Moshe Idel had claimed. See Moshe Idel, "We Have No Kabbalistic Tradition on This," in Isadore Twersky, ed., *Rabbi Moses Nahmanides (Ramban): Explorations in His Religious and Literary Virtuosity* (Cambridge, MA: Harvard University Press, 1983), pp. 51–74.

[112] For an identification and discussion of Nahmanides' immediate disciples, their disciples, and other kabbalists who were influenced by Nahmanides, see Haviva Pedaya, *Nahmanides: Cyclical Time and Holy Text* (Tel Aviv: Am Oved, 2003), pp. 98–119 (Heb.).

[113] Nahmanides' philosophy of nature awaits full analysis. For now see Langermann, "Acceptance and Devaluation," esp. pp. 236–41. In general, it should be noted that as a practicing physician, Nahmanides was attuned to physical phenomena, especially those associated with the human body.

[114] See Ḥayyim Dov Chavel, ed., *Kitvei ha-Ramban* (Jerusalem: Mossad Ha-Rav Kook, 1963), 1: 379.

causes, as Aristotelian physics would have it, but rather the operation of divine providence that sustains the world through "hidden miracles" (*nissim nistarim*).[115] Finally, Nahmanides (along with other kabbalists of Gerona) was committed to the esoteric doctrine that the universe is governed by cosmic cycles (*šemiṭṭot*) of seven thousand years each, which will terminate with the destruction of the universe in the fifty-thousandth year, the cosmic Jubilee.[116] This notion of cosmic cycles, based on the biblical laws of the sabbatical year, had several non-Jewish parallels (especially in Hindu and Stoic sources), but the closest and most probable source of kabbalistic speculations was the Ismaili version, which was linked to the political theory of the imamate.[117] In short, Nahmanides offered a full-fledged kabbalistic alternative to Maimonides' Aristotelian philosophy of nature, one that took magic seriously as "applied science."

Nahmanides' reluctance to explicate kabbalistic doctrines in public illustrates that in the first half of the thirteenth century, both Aristotelian philosophy-science and kabbalah presented themselves as compelling esoteric programs, in the sense that the external meaning of Scripture contained an inner, deeper meaning. Each program claimed to decode the inner, hidden meaning of divine revelation, which could not be divulged to the uneducated masses for fear it would be misunderstood or misapplied. Both programs were reserved for the intellectual elite, and both claimed that their teachings had salvific merit, namely, that the knowledge they imparted was necessary and sufficient for the attainment of the ultimate end of human life: the survival of the individual soul. The difference between the two programs boiled down to the differences between Aristotle and Plato with regard to the definition of scientific knowledge. For the Jewish Aristotelians, science (i.e., natural philosophy) meant a causal explanation of the physical world on the basis of sensory perception and observation; for the kabbalists, in accord with the Platonic view, the physical world was only *a metaphor of reality*, a reflection of intelligible forms that cannot be perceived by the senses.[118] The

[115] Nahmanides' doctrine of "hidden miracles" has received conflicting interpretations in modern scholarship. In addition to Langermann, "Acceptance and Devaluation," see David Berger, "Miracles and the Natural Order in Nahmanides," in *Rabbi Moses Nahmanides (Ramban)*, pp. 107–28; Bernard Septimus, "'Open Rebuke and Concealed Love': Nahmanides and the Andalusian Tradition," ibid., pp. 11–34; Amos Funkenstein, "Nachmanides' Symbolical Readings of History," in J. Dan and F. Talmage, eds., *Studies in Jewish Mysticism* (Cambridge, MA: Association for Jewish Studies, 1982), pp. 129–50; idem, *Perceptions of Jewish History* (Berkeley: University of California Press, 1993), pp. 105–9; Michael Zvi Nehorai, "The Doctrine of Miracle and Nature in Nahmanides and its Relationship to R. Judah Halevi," *Daʿat* 17 (1983): 23–31 (Heb.).

[116] The doctrine of cosmic cycles (*šemiṭṭot*) was elaborated by *Sefer ha-Temunah* (The Book of the Figure), probably composed in Byzantium in the fourteenth century; it was also found in *Sefer ha-Qanah* and *Sefer ha-Peliʾah,* which were also products of Byzantine Jewish culture. During the fourteenth century, however, the doctrine was a matter of dispute among kabbalists in Spain, but mapping the dispute is not easy. In general, the kabbalists of Catalonia, who were associated with Nahmanides, endorsed the doctrine (e.g., Isaac Ibn Latif, Jacob ben Sheshet, and the anonymous author of *Maʿarekhet ha-ʾelohut*). However, the doctrine is clearly absent from the bulk of the Zohar, although echoes can be discerned in its most esoteric segments, the *Idrot.* In the fourteenth century, the kabbalists of Castile rejected the doctrine, but other kabbalists who were influenced by the Zohar endorsed the doctrine and fused it with the teachings of Nahmanides. See Pedaya, *Nahmanides*, pp. 211–13. See also Moshe Idel, "Some Concepts of Time and History in Kabbalah," in Elisheva Carlebach, John Efron, and David N. Myers, eds., *Jewish History and Jewish Memory: Essays in Honor of Yosef Hayim Yerushalmi* (Waltham, MA: Brandeis University Press, 1998), pp. 153–88.

[117] On the Ismaili variant of cosmic cycles and their political implications, see Sāmī Nassīb Makārem, *The Political Doctrine of the Ismāʿīlīs (the Imamate): An Edition and Translation, with Introduction and Notes, of Abū l'-Fawāris Ahmad ibn Yaʿqūb's ar-Risāla fīl-imāma* (Delmar, NY: Caravan Books, 1977), pp. 28–34.

[118] A similar and parallel dynamic can be traced among contemporary Christian thinkers, involving the followers of the Augustinian tradition, who were committed to symbolic mentality, and those open to the Aristotelian scientific outlook. See Marie-Dominique Chenu, *Nature, Man and Society: Essays on New Theological Perspectives in the Latin West,* ed. and trans. Jerome Taylor and Lester K. Little (Chicago: University of Chicago Press, 1968).

relationship between these ideal realities – the sefirot and the Hebrew letters – and the physical world can be received only by revelation and fathomed by means of kabbalistic symbolic hermeneutics.

The Dissemination of Aristotelian Science

Whereas kabbalists, especially Nahmanides' circle, carefully guarded the transmission of esoteric knowledge, the rationalist philosophers began relaxing their elitism and commitment to esotericism after 1210 and especially after the 1230s. From then on they were committed to making science accessible to Jews, initially by translating Averroes' commentaries on Aristotle into Hebrew,[119] a project that led to Gersonides' supercommentaries in the 1320s. The absorption of Aristotelian natural philosophy by Jewish philosophers, begun in the mid-twelfth century, was completed by the 1340s. The Jewish sacred tradition was now to be interpreted in the light of Aristotelian natural philosophy.

For the dissemination of Aristotelian natural philosophy, the Hebrew anthologies and encyclopedias composed from the late 1240s on were even more crucial than the translations. The first encyclopedia, *Midrash ha-ḥokhmah* by Judah ben Solomon ha-Kohen Ibn Matqah, was composed in Arabic, probably while he was still in Spain before he moved to the court of Frederick II in Sicily; the author then translated it into Hebrew between 1245 and 1247. This compilation of scientific information was intended to boost Jewish pride by showing that Jews were not lacking in scientific knowledge as well as to help Jews who studied Scripture recognize some of the problems of contemporary science and to "warn against the dangers of this science."[120]

The greatest popularizer of Aristotelian science was Shem-Ṭov Falaquera (d. 1295). In 1265 he wrote *Reshit ḥokhmah* (Beginning of Wisdom), which incorporated an abridged translation of Alfarabi's *Iḥṣāʾ al-ʿulūm.*[121] Around 1270 Falaquera assembled *Deʿot ha-filosofim* (Opinions of the Philosophers), an anthology of texts about physics and metaphysics, mostly by Averroes but also by Avicenna, Alfarabi, Alexander of Aphrodisias, Themistius, and other authors, including Aristotle. These texts, which were directly translated from Arabic into Hebrew, provided a complete and detailed commentary on Aristotle's *Physics, Generation and Corruption, Meteorology, On Animals, On the Soul, On the Heavens,* and *Metaphysics,* along with some non-Aristotelian subjects such as mineralogy and botany.

In Provence, the hotbed of the Maimonidean controversy, the dissemination of Aristotelian science and philosophy received a boost in 1276 when Levi ben Abraham ben Ḥayyim of Villefranche-de-Conflent, the author of *Livyat ḥen,* composed *Battei ha-nefesh ve-ha-leḥashim* (On the Faculties of the Soul and Divine Secrets). Its ten books cover as many topics – ethics, logic, creation, psychology, prophecy, the Chariot, arithmetic and geometry, astronomy and astrology, natural science or physics, and divine science or metaphysics – touching on areas that the kabbalists considered to be their exclusive domain. Levi ben Abraham enabled "a wider audience of readers to appreciate the teachings of Maimonides'

[119] See Steven Harvey, "Arabic into Hebrew: The Hebrew Translation Movement and the Influence of Averroes upon Medieval Jewish Thought," in *The Cambridge Companion to Medieval Jewish Philosophy,* pp. 258–80, on p. 260. For the sociocultural context of Jewish approaches to the study of the natural sciences in the Middle Ages, see Gad Freudenthal, "Science in the Medieval Jewish Culture of Southern France," *History of Science* 33 (1995): 23–58.

[120] Resianne Fontaine, "Judah ben Solomon ha-Cohen's Midrash ha-Hokhmah: Its Sources and Use of Sources," in *Medieval Hebrew Encyclopedias,* pp. 191–210, on p. 206.

[121] Steven Harvey, "Shem Tov Ibn Falaquera's *Deʿot ha-filosofim*: Its Sources and Use of Sources," in *Medieval Hebrew Encyclopedias,* pp. 211–37, on p. 211.

Guide,"[122] dealing explicitly with *maʿaśeh merkavah* in accordance with Aristotelian physics. Much the same can be said of the anonymous short "introduction" to the *Guide*, known under the title *Ruaḥ ḥen*, published toward the middle of the thirteenth century and very widely diffused.

Finally, between 1275 and 1300, Gershom ben Solomon of Arles compiled another scientific encyclopedia, *Shaʿar ha-shamayim* (Gate of Heaven), which contained sections on the natural sciences, including meteorology, mineralogy, botany, zoology, and human anatomy and behavior.[123] Although his sources were mainly Arabic originals, Gershom read them in Hebrew translation and also relied on Falaquera's encyclopedia. James Robinson has shown that Gershom "draws from Aristotelian and Neoplatonic philosophy, combines philosophy and medicine, uses Latin to Hebrew and Arabic to Hebrew translations, and takes material directly from the translations as well as second hand from Hebrew encyclopedias and works of religious philosophy."[124] Although the author generally avoided Averroes' commentaries on Aristotle because they were controversial, he clearly had access to them given that they had been summarized by Falaquera.

Kabbalah Takes a Public Stand

The dissemination of Aristotelian natural philosophy among the Jewish intelligentsia after the 1240s was fully noted by the kabbalists, who studied Maimonides' *Guide* and wrestled with the Maimonidean interpretation of the biblical text. From 1270 to 1290, there was a burst of creativity in kabbalah, as documented by Moshe Idel.[125] I believe that this creativity reflected the maturation of the kabbalists' awareness of their doctrine as an alternative to Maimonideanism, even though the kabbalists held Maimonides in great respect. We should note that both Jewish Aristotelianism and kabbalah saw themselves as programs for spiritual perfection that help the knower attain the ultimate end of human life (i.e., happiness).[126] Both intellectual programs equated happiness with the immortality of the individual soul, but they disagreed about what exactly constitutes the immortal soul and what knowledge is necessary and sufficient for the attainment of personal immortality. This debate was important because it was precisely the issue that separated the Jewish and Christian communities.

In 1263 Nahmanides was summoned to defend Rabbinic Judaism against Pablo Christiani, a Jewish apostate who had joined the Dominican order and argued that Jewish aggadot actually teach the truth of Christianity.[127] In the disputation, supervised by James I of Aragon, Nahmanides was maneuvered to concede that aggadot do not have authoritative status in Rabbinic Judaism, a view that at least superficially conflicted with his own opinion.[128] Within a

[122] Warren Zev Harvey, "Levi ben Abraham of Villefranche's Controversial Encyclopedia," in *Medieval Hebrew Encyclopedias*, pp. 171–8, on p. 176.

[123] See Mauro Zonta, "Mineralogy, Botany and Zoology in Medieval Hebrew Encyclopedias: 'Descriptive' and 'Theoretical' Approaches to Arabic Sources," *Arabic Sciences and Philosophy* 6 (1996): 263–315.

[124] James T. Robinson, "Gershom ben Solomon of Arles' *Shaʿar ha-Shamayim*: Its Sources and Use of Sources," in *Medieval Hebrew Encyclopedias*, pp. 248–74, on p. 267.

[125] See Moshe Idel, "The Kabbalah's 'Window of Opportunities,' 1270–1290," in Ezra Fleischer, Gerald Blidstein, Carmi Horowitz, and Bernard Septimus, eds., *Me'ah Sheʿarim: Studies in Medieval Jewish Spiritual Life in Memory of Isadore Twersky* (Jerusalem: Magnes Press, 2001), pp. 170–208.

[126] For a fuller treatment of this thesis, see Hava Tirosh-Samuelson, *Happiness in Premodern Judaism: Virtue, Knowledge, and Well-Being* (Cincinnati: Hebrew Union College Press, 2003), esp. pp. 291–342.

[127] For an analysis of the procedure and arguments in the Barcelona disputation, see Robert Chazan, *Barcelona and Beyond: The Disputation of 1263 and Its Aftermath* (Berkeley: University of California Press, 1992).

[128] The best discussion of the connection between the Barcelona disputation and Nahmanides' hermeneutics can be found in Wolfson, "By Way of Truth," pp. 169–78.

week after the disputation, Nahmanides delivered the famous sermon *Torat ha-shem temimah,* expounding his own conception of Torah and the correct strategies for interpreting it. Although Nahmanides' own account depicted him as victorious, the political fallout was less positive. Two years later the Dominicans prevailed on James to muzzle Nahmanides, who left Spain. It was no coincidence that Nahmanides chose to settle in the Land of Israel, where he died in 1271, because he believed that only there could Jews experience a "full religious life."[129]

The dissemination of Aristotelian science and the results of the Barcelona disputation compelled kabbalah "to go public" to make its prescription for salvation more accessible to all Jews. Making the soteriological lore of kabbalah more accessible could bolster the faith of the beleaguered Jewish community against Christian triumphalism.[130] After the 1270s the dissemination of kabbalistic prescriptions for salvation had three different trajectories.

First, the esoteric teachings of Nahmanides were made more public in the Torah commentary by Baḥya ben Asher, by the systematization of kabbalah in the anonymous *Maʿarekhet ha-ʾelohut,* and in the commentaries on Nahmanides' cryptic allusions by disciples of Solomon Ibn Adret, such as Shem-Ṭov Ibn Gaon.

The second trajectory is evident in the teachings of Abraham Abulafia, who publicized his prophetic kabbalah as the correct exposition of the secrets of the *Guide* and in whose works the salvific import of kabbalah was even more pronounced than among Ibn Adret's disciples. Claiming to have achieved a union of his own intellect with the Agent Intellect, Abulafia maintained that he decoded the esoteric meaning of the Torah. On the basis of the numerical values of letters, the numerology of the German Pietists, and Maimonides' philosophy, Abulafia reconstructed the inner meaning of the Torah, which he proceeded to invest with messianic import.[131] Although Abulafia acquired students in the East and in Sicily, his prophetic kabbalah and messianic propaganda drew sharp opposition from the rabbinic leadership in Spain (mainly Ibn Adret) and did not sit well with the papal authorities in Italy.[132] Nonetheless, Abulafia's idiosyncratic teachings would become extremely influential in the late fifteenth century, when they were translated into Latin and studied by Christian humanists in Italy.[133]

[129] See Moshe Idel, "The Land of Israel in Medieval Kabbalah," in Lawrence A. Hoffman, ed., *The Land of Israel: Jewish Perspectives* (Notre Dame: University of Notre Dame Press, 1986), pp. 170–87, on p. 178.

[130] On kabbalah as a response to Christianity, especially the spread of the Marian cult and its salvific claims, see Peter Schäfer, *Mirror of His Beauty: Feminine Images of God from the Bible to the Early Kabbalah* (Princeton: Princeton University Press, 2002), pp. 229–35.

[131] For an explication of Abulafia's idiosyncratic type of kabbalah, see Moshe Idel, *Studies in Ecstatic Kabbalah* (Albany: SUNY Press, 1988); idem, *Language, Torah, and Hermeneutics in Abraham Abulafia* (Albany: SUNY Press, 1989); Elliot R. Wolfson, *Abraham Abulafia, Kabbalist and Prophet: Hermeneutics, Theosophy, and Theurgy* (Los Angeles: Cherub Press, 2000). Despite the difference between the theosophic kabbalah of the Zohar and Abulafia's prophetic-ecstatic kabbalah, they share the crucial assumption about the letters of the divine name as the "building blocks" of reality. For an overview of the interplay between these two types of kabbalah and medieval Jewish philosophy, see Hava Tirosh-Samuelson, "Philosophy and Kabbalah: 1200–1600," in *The Cambridge Companion to Medieval Jewish Philosophy,* pp. 218–57.

[132] See Idel, *Studies in Ecstatic Kabbalah,* pp. 45–62.

[133] The interest in kabbalah (whether Abulafian or the Zohar version) among Renaissance humanists went hand in hand with the efflorescence of the occult sciences at the time, especially alchemy and astrology. For an anthology of relevant primary sources in English translation, see P. G. Maxwell-Stuart, ed. and trans., *The Occult in Early Modern Europe: A Documentary History* (London: Palgrave, 1999). For an analysis of the status of the occult sciences in Renaissance culture, see Brian Vickers, ed., *Occult and Scientific Mentalities in the Renaissance* (Cambridge: Cambridge University Press, 1984); William R. Newman, "The Occult and the Manifest among the Alchemists," in F. Jamil Ragep and Sally P. Ragep, eds., *Tradition, Transmission, Transformation* (Leiden: Brill, 1996), pp. 173–98, and the bibliography cited there.

Because of Ibn Adret's ban on Abulafia's works, the dominant form of kabbalah in Spain came to be that of the mystical fraternity that produced the Zohar, whose most creative member was Moses de Leon.[134] The Zohar, the third trajectory for the development of kabbalah after 1280, circulated its prescription for salvation as a commentary on the Torah, framed as a dramatic narrative in which the second-century *tanna* Simeon bar Yohai and his companions enjoy revelatory experiences while strolling through the Holy Land. In the Zohar, the linguistic doctrines of SY reached new heights with the disclosure of the semantic rules that govern the grammar and syntax of nature, the metaphor of reality. Yet these revelations were not understood to be a mere artistic flourish that sprang from the private imagination of their author. Rather, they were regarded as theoretical knowledge that explained *the structure of reality* or the way things are. In other words, the linguistic teachings of the Zohar were taken to be science par excellence. The symbolism of the Zohar, which the kabbalists took to provide information about the natural world, was intended not only to provide an explanation for the way things are but also to offer a technique – or, better still, a verbal technology – to achieve practical results. One who possesses the secrets revealed in the Zohar is allegedly empowered to control and manipulate the physical world (i.e., engage in magic) and can even influence God (i.e., engage in theurgy) by bringing about the unification of the masculine and feminine aspects of God. These rituals are redemptive activities that restore and rehabilitate all aspects of reality – personal, national, cosmic, and divine.[135] The redemptive import of the Zohar was understood immediately by other kabbalists, for example, the anonymous author of the *Raʿaya meheimna* and the *Tiqqunei Zohar,* whose imitation of the Zohar was so successful that it was incorporated into the Zohar itself. During the Renaissance, both Jewish and Christian scholars would further develop the implications of the Zohar as a redemptive text.[136]

Thus it seems reasonable to suggest that the unprecedented creativity of kabbalah at the end of the thirteenth century was the result of an urgency felt by kabbalists to counter Christian pressure, on the one hand, and the growing acceptance of Aristotelian science among Jews, on the other. By the end of the thirteenth century, kabbalists, too, were more informed about Aristotelian natural philosophy, even though they were promoting theosophic kabbalah as an alternative to it. Thus Joseph ben Shalom Ashkenazi's commentary on the section of Genesis Rabbah that deals with the weekly portion of *Bereshit*, written in Morocco in the early fourteenth century, is replete with allusions to Aristotelian natural philosophy (which he summarized in ninety-four propositions), even as it reviles Aristotle for leading Jews astray and presents kabbalah as a superior natural philosophy.[137]

In the mid-fourteenth century, there were new attempts to rethink the relationship of kabbalah and Aristotelian science by scholars equally versed in the two traditions. For example, Joseph ben Abraham Ibn Waqar's commentary on SY and Moses Narboni's commentary

[134] That the Zohar is a collective product was first proposed by Yehuda Liebes, "How the Zohar Was Written," in his *Studies in the Zohar,* trans. Arnold Schwartz, Stephanie Nakache, and Penina Peli (Albany: SUNY Press, 1993), pp. 85–138. This view is now the consensus among scholars of kabbalah.

[135] The messianic import of the Zohar is analyzed by Yehuda Liebes, "The Messiah of the Zohar," ibid., pp. 1–84.

[136] See Moshe Idel, "The Magical and Neoplatonic Interpretations of the Kabbalah in the Renaissance," in Bernard Dov Cooperman, ed., *Jewish Thought in the Sixteenth Century* (Cambridge: Harvard University Press, 1983), pp. 186–242, repr. in David B. Ruderman, ed., *Essential Papers on Jewish Culture in Renaissance and Baroque Italy* (New York: New York University Press, 1987), pp. 107–69; Hava Tirosh-Rothschild, "Jewish Philosophy on the Eve of Modernity," in Daniel H. Frank and Oliver Leaman, eds., *History of Jewish Philosophy* (New York: Routledge, 1997), pp. 499–573, esp. pp. 525–9.

[137] See Hallamish, *A Kabbalistic Commentary*, pp. 160–85. I intend to devote a separate study to this text, which is crucial for the topic of the present chapter. Although Ashkenazi settled in North Africa, Yehuda Liebes conjectures that he was part of the mystical fraternity that produced the Zohar ("How the Zohar Was Written," pp. 93–5).

on *Shiʿur Qomah* correlated Aristotelian philosophy and kabbalah,[138] presenting the kabbalistic doctrine of sefirot and Aristotelian cosmology as different systems that referred to the same supernal, incorporeal entities. Kabbalah and Aristotelian natural philosophy could be understood in this way because Jewish Aristotelianism itself underwent changes in the second half of the fourteenth century, when thinkers such as Samuel Ibn Zarza, Samuel Franco, Shem-Ṭov Ibn Shaprut, and others reinvested it with Neoplatonic and Hermetic themes that had been rejected by Maimonides but preserved in kabbalah. While continuing to admire Maimonides, they made Abraham Ibn Ezra their intellectual hero and composed supercommentaries on his commentaries on the Pentateuch.[139] In those works they articulated a new philosophy of nature, blending elements of Aristotelianism, Neoplatonism, Hermeticism, and kabbalah and bridging the gap between philosophy, science, and magic.

KABBALAH AS ALTERNATIVE SCIENCE: TWO READINGS OF GENESIS AS A CASE STUDY

My contention is that kabbalah was not antiscientific per se; rather, its adherence to an alternative, Platonic notion of scientific knowledge and a Platonic view of nature as a metaphor of reality led it to reject Aristotelian science. The complex relationship between kabbalah and Aristotelian natural philosophy during the first part of the thirteenth century can be better understood if we look at the polemical exchange between Samuel Ibn Tibbon and Jacob ben Sheshet about the correct interpretation of the biblical creation narrative. Their point of departure was Maimonides' reading of Genesis.

In *Guide* II, 30 Maimonides writes that Genesis should be read in light of Aristotle's *Meteorology*.[140] In that text Aristotle explained how the two "'exhalations' – the hot and dry and hot and moist – arise from the earth and nourish respectively the upper and lower parts of the atmosphere, the air sphere and the fire sphere."[141] According to Maimonides, the Aristotelian text contained the exegetical key to the meaning of specific Hebrew terms in the biblical narrative, including *šamayim* (heavens), *raqiaʿ* (firmament), *mayim meʿal la-raqiaʿ* ("water above the firmament"), and *mayim mi-taḥat la-raqiaʿ* ("water below the firmament"). However, the precise correlation between the vocabulary of Genesis and the processes described in the *Meteorology* remained open to interpretation, because Maimonides was rather vague about the details and left his commentators many exegetical and philosophical challenges.[142]

The exegetical challenge, as Sara Klein-Braslavy beautifully explains, arose from the fact that biblical terms may be equivocal (a given word has more than one meaning) or homonymous (two words denote the same thing). For example, in his interpretation of Genesis 1:1, Maimonides identified the word *šamayim* (heavens) with the celestial orbs (*galgalim*); however, in Genesis 1:8, the word *šamayim* is identified with the word *raqiaʿ* (firmament). If the biblical text is to be interpreted as compatible with Aristotelian physics and if *šamayim* refers to the uppermost sphere, how can there be "water above the firmament," given that in

[138] See Tirosh-Samuelson, "Philosophy and Kabbalah, 1200–1600," pp. 236–41.

[139] See Dov Schwartz, *The Philosophy of a Fourteenth-Century Jewish Neoplatonic Circle* (Jerusalem: Bialik Institute and the Ben Zvi Institute for the Study of Jewish Communities in the East, 1996), pp. 160–71 (Heb.).

[140] The following discussion is based on Sara Klein-Braslavy, *Maimonides' Interpretation of the Story of Creation* (Jerusalem: Reuben Mass, 1987), pp. 160–74 (Heb.).

[141] R. J. Hankinson, *Cause and Explanation in Ancient Greek Thought* (Oxford: Clarendon Press, 1998), p. 178.

[142] Aristotle's *Meteorology* continued to engage Jewish philosophers throughout the thirteenth century and well into the fourteenth century, when Gersonides wrote a supercommentary on Averroes' commentary on the *Meteorology*. For an analysis of this text, see Eyal Miron, "Supercommentary of R. Levi ben Gershom on the *Epitome* by Ibn Rushd on *Meteorology* 1–3: A Comparative Study of Optical, Physical, and Mathematical Aspects of Theories on the Aura and the Rainbow," Ph.D. dissertation, Hebrew University, 2003.

Aristotelian physics there is nothing above and beyond the uppermost sphere? If the Bible is to correspond to Aristotelian physics, *raqiaʿ* in Genesis 1:6–8 must have a different meaning. The "firmament" and the "water" of those verses must therefore pertain to another region, that is, to the atmosphere, the region between the terrestrial and the celestial realms.

The challenge was resolved by noting the ambiguity of the word "water." It refers first and foremost to "undifferentiated primeval stuff" (as Langermann translates) or "elemental water" (Klein-Braslavy).[143] On the second day of creation, God differentiated the water by imposing a specific form on a certain matter. Thus, the "water below the firmament" refers to seawater, which came from the fusion of the moist vapor and the dry vapor, which are terrestrial elements.[144] However, the "firmament" and the "water above the firmament" belong to the region where the moist vapor has cooled (it is no longer heated by fire or by the reflection of the sun or by the motion of the celestial orbs). In short, the "firmament," the "water below the firmament," and the "water above the firmament" share the same material substratum, but they received different forms, producing different substances.

Although the general principles of Maimonides' hermeneutical strategy were clearly stated, the *Guide* provided only a philosophical dictionary to the biblical text and not a full-fledged commentary. Because readers were left to apply the general principles as they saw fit, diverse and conflicting readings of Maimonides' view on the origin of the universe emerged.[145] Generally speaking, the more one read the Bible in light of Aristotle's *Meteorology*, the more one posited a naturalistic explanation of creation, compromising God's voluntary activity either in the act of creation or in the governance of the physical world. The more closely one followed Maimonides' interpretive principle, the more one understood creation to pertain only to physical processes in the atmosphere rather than to the creation of the universe as a whole.

This was precisely the approach adopted by Samuel Ibn Tibbon in *Maʾamar yiqqawu ha-mayim*, which was in effect a philosophical commentary on Genesis, based on Aristotle's *Meteorology*. For Ibn Tibbon, the biblical creation narrative depicted natural processes that take place in the various regions of the atmosphere. The "upper water" corresponds to the hot exhalation, whereas the "firmament" is the "lower water" that occupies the lower stratum of the cold exhalation. The radical aspect of Ibn Tibbon's reading is the claim that the creation narrative is *not* about the temporal creation of the entire universe, but only about the processes of differentiation and coming into being that take place inside the physical cosmos. The term *šamayim* does not designate the heavens and the stars but only a certain region of the atmosphere, and *ʾereṣ* does not refer to the entire physical universe (all four elements) but only to the dry land exposed by the evaporation and consolidation of water.[146] If so, the biblical creation narrative describes the entirely natural process that brought forth the material world.

Jacob ben Sheshet's *Meshiv devarim neḵoḥim* shows that at least some thirteenth-century kabbalists were knowledgeable in Aristotelian science but rejected it on religious and philosophical grounds. In particular, Jacob rejected the attempt to read the creation narrative in Genesis in the light of Aristotelian physics as expressed in the *Meteorology*. For the kabbalist, the account in Genesis pertains not to physical processes in the atmosphere but to processes within the Godhead that are the causes of events in the physical world. Only knowledge of

143 See Y. Tzvi Langermann, "Maimonides and the Sciences," in *The Cambridge Companion to Medieval Jewish Philosophy*, pp. 157–75, on p. 162.

144 Klein-Braslavy, *Maimonides' Interpretation*, p. 162.

145 For a detailed study of the various modern attempts to resolve the puzzle, see Norbert M. Samuelson, "Maimonides' Doctrine of Creation," *Harvard Theological Review* 84(3) (1991): 249–71.

146 For a detailed discussion see Ravitzky, "Aristotle's *Meteorology*."

the sefirot and their dynamic interplay can explain how the physical world relates to God and how change occurs in the material world. The dispute between the Aristotelian philosopher and the kabbalist of Gerona thus relates to the origin of the cosmos, causality, and motion, that is, to the core issues of natural philosophy.

Samuel Ibn Tibbon and Jacob ben Sheshet shared the assumption that the Torah is an esoteric text whose inner meaning contains truths about the structure of the universe and its origin. However, Jacob carried this assumption to an extreme, claiming (as did Nahmanides and Azriel of Gerona) that all scientific disciplines (*ḥoḵmot*) are "hinted" (*remuzot*) in the Torah and "there is no science in the world that has no proof (*reʾayah*) in the Torah, be it astronomy (*ḥoḵmat ha-koḵavim*), medicine (*ḥoḵmat ha-refuʾot*), or mathematics (*ḥoḵmat ha-šiʿur*) and all other disciplines, including the interpretation of dreams (*pitron ḥalomot*)."[147] For him, the Torah is the universal paradigm of reality and the intelligible order of the universe. According to Jacob, it was precisely because "the Torah encompasses all the sciences"[148] that the psalmist referred to the Torah as "perfect" (*temimah*);[149] it was because the Torah is the perfect model of the universe that Genesis Rabbah states that God was looking at or contemplating (*mabbiṭ*) the Torah when He created the world.[150] For Jacob, then, the followers of Maimonides are mistaken when they claim that human beings of flesh and blood can know all there is to know. In truth, "there is a limit to what any person can grasp" (*yeš gevul le-haśśagat kol maśśig*), and the "all-embracing idea is the Torah, according to which the world is governed and sustained" (*ve-ha-haśśagah ha-kelalit hiʾ ha-torah še-ha-ʿolam mitnaheg u-mitqayyem bah*).[151]

The notion that the Torah encompasses all scientific knowledge has important ramifications for the assessment of the role played by kabbalah vis-à-vis the natural sciences. On the one hand, Jacob took the Torah to be a scientific text encompassing all the sciences: not only physics, astronomy, and medicine, as the philosophers maintained, but also the occult sciences and the magical arts, such as dream interpretation and ornithomancy, which the Aristotelian philosophers categorically rejected as nonscientific.[152] Jacob's inclusion of the occult sciences and the magical arts within the scope of "science" was neither irrational nor antiscientific; it was, rather, the expression of a non-Aristotelian concept of science derived from Hermetic and Neoplatonic traditions that were prevalent among Jewish intellectuals but rejected by the Maimonideans. Yet, the claim that the Torah encompasses all scientific knowledge also means that Jews, because they possess the Torah, need not concern themselves with the empirical study of nature based on sense perception. If the Torah is the

[147] Jacob ben Sheshet Gerondi, *Sefer Meshiv devarim neḵoḥim*, ed. Georges Vajda (Jerusalem: Israel Academy of Sciences and the Humanities, 1968), p. 79 (hereinafter MDN).

[148] MDN, p. 83.

[149] MDN, p. 79.

[150] Although the Platonic overtone of this famous midrash has long been recognized by scholars, not enough attention has been paid to the echo of the *Timaeus* in rabbinic interpretations of Genesis. One exception is Norbert Samuelson, *Judaism and the Doctrine of Creation* (Cambridge: Cambridge University Press, 1994), passim. It seems to me that this Platonic geometric-architectonic understanding of the act of creation explains the prevalence of visual terminology in the texts of Geronese kabbalah and the reference to the sefirot system as *temunah*, literally "picture" but better translated as "figure." For the kabbalists, the world of the sefirot, configured in the structure of Adam Qadmon, the Divine Anthropos, was the abstract model of the universe. Thus visualization of the divine figure was the highest form of knowledge and superior to the empirical knowledge of the philosophers. For a different, phenomenological interpretation of the act of visualization in Geronese kabbalah, which links the visualization with the internal experience of the mystic, see Pedaya, *Nahmanides*, pp. 173ff.

[151] MDN, p. 92.

[152] Nahmanides, as we have seen earlier, shared the same positive attitude toward magic. See Pedaya, *Nahmanides*, p. 175. For Jacob ben Sheshet, magic was only one type of scientific knowledge, applied science of a sort, contained in the Torah, but not the inner, deepest content of Torah.

paradigm of the universe, not only is Torah study (following kabbalistic methods of interpretation) the only scientific activity that need concern the Jews; in fact, the highest scientific knowledge available to humanity is the exclusive privilege of the Jews. The paradigm of the universe is accessible only to those who receive the correct interpretation of Torah by way of kabbalah, but it remains occult or hidden to the human senses and to empirical investigation. The kabbalistic understanding of Torah explains why Jacob ben Sheshet felt so utterly self-confident in his debate with Samuel Ibn Tibbon.

Jacob found Ibn Tibbon's reading unacceptable both religiously and philosophically. First of all, he charged that Ibn Tibbon did not interpret Maimonides correctly when he identified the Master's views with those of Aristotle. Aristotle denied that God knows particulars and extends personal providence to creatures, but Maimonides openly rejected Aristotle in *Guide* III, 17. Hence "the opinion of Maimonides and the opinion of Aristotle are not identical."[153] When Ibn Tibbon presented Maimonides as a believer in the eternity of the universe he was ascribing his own heretical views to Maimonides. Furthermore, it is wrong to present Maimonides, as did Ibn Tibbon, as a person who asserts the divine origin of the Torah only for the sake of the masses when he himself doubted it. Maimonides, states Jacob, had no intention of deceiving his readers and did not think that scientific knowledge of the world posed a challenge to the divine origin of the Torah. There is no conflict between the teachings of the Torah and the science of physics; nor does scientific knowledge undermine the commandments of the Torah.[154] In short, Ibn Tibbon misrepresented Maimonides when he ascribed to him certain heretical views that were in fact his own.

The dispute between Ibn Tibbon and Jacob ben Sheshet was not limited to the scope of the biblical creation narrative; that is, whether it pertains to events in the atmosphere or to the origin of the universe as a whole. Even more fundamental is the metaphysical debate about the relationship between matter and form. Aristotle was the source of this metaphysical terminology, but Jewish philosophers held varied interpretations of this relationship. Jacob followed the interpretation of Abraham Bar Ḥiyya (in *Hegyon ha-nefeš ha-ʿaṣuvah* [Meditation of the Sad Soul]), who was the first to equate the biblical language of *tohu va-vohu* with the metaphysical principles of matter and form, respectively.[155] In this interpretation, *tohu* is identified with universal matter (*ha-ḥomer ha-huʾ kolel kol ha-ḥomarim*) and *bohu* with universal form (*ha-ṣurah . . . še-kolelet kol ha-ṣurot*).[156] When the biblical text states that "the Earth was *tohu*," it refers to the process by which the formless nothing (*ʾayin*) was actualized, becoming something that can "sustain a Form" (*nitḥazzeq le-qabbel ṣurah ve-lisbol otah*); *bohu* is that form, which Jacob defines as the "Form of Corporeity" (*ṣurat ha-meṣiʾut*). The biblical narrative, then, is about the interplay of two metaphysical principles – matter and form – repeated in all existents and on all level of the ontological hierarchy. Thus, all things manifest the interplay of matter and form, as Aristotle indeed posited, with the caveat that "not every matter deserves (*raʾuy*) to receive every form and not every form deserves to be wrapped (*le-hitlabbeš*, i.e., to be actualized) in every matter."

If *tohu* and *bohu* are symbolic references to matter and form, what do the "heavens" (*šamayim*) and the "earth" (*ʾereṣ*) symbolize, according to Jacob? Like other kabbalists, he took them to be symbolic expressions of two main sefirot, tifʾeret and malkhut, respectively. Again, the biblical narrative about the creation of the heavens and the earth pertains not to physical objects (the sky and the terrestrial world) that can be perceived by the senses,

[153] MDN, p. 159.
[154] MDN, p. 145.
[155] Abraham Bar Ḥiyya, *The Meditation of the Sad Soul,* trans. Geoffrey Wigoder (New York: Schocken, 1969), pp. 39–44.
[156] MDN, p. 118.

but rather to occult metaphysical processes that give rise to physical entities. It is here that the difference between the theosophic kabbalist and the Aristotelian philosopher becomes most evident, because the kabbalist adopted a Neoplatonic interpretation of the relationship between matter and form, derived from Jewish philosophers like Abraham Bar Ḥiyya and Solomon Ibn Gabirol.

The "heavens" and the "earth" of the biblical narrative refer to two aspects of universal matter. The aspect that became "heavens" is light itself, which Jacob identifies with the Form of Corporeity. This form is transformed into other forms: the Form of Light (*ṣurat ha-ʾor*), the Form of the Souls (*ṣurat ha-nešamot*), the Form of the Orbs (*ṣurat ha-galgalim*), the Form of the Angels (*ṣurat ha-malʾakim*), and the Form of Man (*ṣurat ʾadam*), and each of these forms will have its respective matter, according to its place in the ontological order. The material correlate of these forms is ultimately derived from what the biblical narrative calls "earth" and the kabbalist calls "malkhut."

In the picture that emerges from Jacob's interpretation of the opening verses of the Bible, the interplay of matter and form belongs not only to the sublunar world but also to all levels of reality, including the most sublime and "spiritual" reality of the supralunar world; namely, the world of the heavenly bodies. This Neoplatonic doctrine, endorsed by Bar Ḥiyya and Ibn Gabirol and perpetuated in kabbalah, was precisely the view that the Jewish Aristotelian Ibn Daud had rejected as philosophically unsound. For the kabbalist Jacob Ibn Sheshet, however, not only was this reading metaphysically correct; it also captured the meaning of the biblical text better than the Aristotelian reading, because it referred not to atmospheric processes but to the very processes by which nothing became something. These metaphysical processes were expressed in SY in the dynamic interplay among sound (*qol*), breath (*ruaḥ*), and speech (*dibbur*), and in Psalm 139 in the metaphoric discussion of light, which represents "the completion of the [divine] will" (*hašlamat ha-ḥefeṣ*). Unlike Ibn Tibbon, who emphasized the necessity of natural processes, Jacob highlights the creative process as actualization of the divine will.

In kabbalistic parlance, the transformation from nothing to something is the emanation of the sefirot from the *Ein Sof*. The first emanated being (*ha-neʾeṣal ha-rišon*) is the sefirah of Ḥokhmah (wisdom), which functions as the "beginning of all existents" (*hatḥalat kol ha-hawayot*).[157] All things are potentially contained in this sefirah; their actualization gives rise to the diversity in the world as we know it. Ḥokhmah, whose symbol is the geometric point, is thus the singularity from which all diversity extends.[158] Most intriguingly, Jacob identifies Ḥokhmah with what the Aristotelian philosophers called the "Active Intellect." By identifying the Active Intellect with Ḥokhmah, the kabbalist directly opposed the Jewish Aristotelians, for whom the Active Intellect is the intelligence in charge of sublunar events. Therefore, philosophers who claim that the highest rank of human knowledge reaches the Active Intellect know less than kabbalists, whose intellect reaches the level of the sefirah of Ḥokhmah.[159]

Jacob ben Sheshet's critique of Ibn Tibbon has an interesting parallel in the Christian world. In the 1220s Robert Grosseteste, then lector to the Friars Minor at Oxford University and later (1235) Bishop of Lincoln, took up the *Meteorology* and wrestled with its implications for the interpretation of Genesis.[160] Grosseteste illustrates that the encounter

[157] MDN, p. 153.

[158] I do not know whether the roster of medieval Jewish mathematicians included practicing kabbalists, but the link between kabbalah and this scientific discipline requires further exploration, given kabbalistic metaphysics and mathematical symbolism.

[159] MDN, p. 113.

[160] James McEvoy, *The Philosophy of Robert Grosseteste* (Oxford: Clarendon Press, 1982), p. 16.

with the *Meteorology* did not necessarily result in reading Scripture according to Aristotle's physics, as Samuel Ibn Tibbon did. Although he adopts the contours of Aristotelian cosmology, Grosseteste consciously deviated from Aristotle's science on several important points, rejecting the assumptions that the world had no beginning in time, that actual infinity is logically impossible, and that there is a qualitative difference between celestial and terrestrial matter. Trained in the Augustinian tradition of biblical interpretation and exposed to Aristotle through the medieval Neoplatonized Jewish and Muslim Aristotelianism, Grosseteste developed a picture of the universe that incorporates some non-Aristotelian notions that are remarkably similar to elements we find in Jacob ben Sheshet's critique of Ibn Tibbon.[161]

Like SY and the Platonic tradition it reflects, Grosseteste views God as a mathematician who "established the basic indivisible units of space and time from which the whole extension and unfolding of the material world is effected."[162] God's wisdom itself is infinite ("without number"), and the "absolute, indivisible point which is the unit of all extension in the universe . . . is the simple point of light from which the cosmogonic process began."[163] Thus the semantic key to Genesis is to be found not in Aristotle's *Meteorology* but in the correct understanding of light as the first form of corporeity, an idea that Grosseteste derived from Solomon Ibn Gabirol and his Muslim sources. The very philosophy that the Jewish Aristotelians had rejected enabled Grosseteste to articulate a non-Aristotelian reading of Genesis that challenged the claims of Aristotelian physics.

The case of Jacob ben Sheshet indicates that the dispute between the Aristotelians and the kabbalists was primarily about metaphysics and the meaning and scope of scientific knowledge. Secondarily, they also disputed specific scientific assertions about the physical world. In *Meshiv devarim neḵoḥim* we find kabbalistic discussion of the sphericity of the earth,[164] the four levels of terrestrial existents (minerals, plants, animals, and humans),[165] and thunder and lightning.[166] Like other kabbalists of his generation, Jacob was conversant with current scientific theories, but argued that scientific knowledge of the physical world is epistemically inferior to knowledge of the sefirot. However, knowledge of the sefirot paradigm, the intelligible structure of reality, is accessible to the mental eye of the kabbalist rather than to the physical eye of the observer of nature. Only the kabbalist, who possesses the deepest scientific knowledge of the sefirot paradigm, can "see" the configuration (*temunah*) of the sefirot, arranged in a particular order. This visual understanding of knowledge, which can be traced to the Greek philosophers, is based on a scientific theory of light and vision that was prevalent among kabbalists and that merits a separate study.[167]

[161] The question of whether Jacob ben Sheshet had knowledge of, let alone contact with, Grosseteste needs further study. It is possible that they developed their views simultaneously but independently, because both Christian and Jewish scholars were wrestling with the problems raised by reading Scripture in the light of medieval science.

[162] Ibid., pp. 75–6.

[163] Ibid., p. 177. The similarity between Grosseteste's understanding of creation and the kabbalistic version is difficult to ignore and requires a separate study (which I hope to undertake). The similarities between the Jewish and Christian scholars on this point can be explained by reference to older Platonic and Neoplatonic texts of Late Antiquity. For example, just as the medieval kabbalists derived their ideas from SY, Grosseteste favored the Wisdom of Solomon, which depicts God as one who "ordered all things by number, weight, and measure" (Wisdom 11:21). Most importantly, Grosseteste's philosophy of light was indebted to Solomon Ibn Gabirol and his Muslim sources; it was Ibn Gabirol's notion that light is the first form of corporeity that accounts for both the unity of matter, on the one hand, and the diversity found in the physical world, on the other hand.

[164] MDN, p. 133.

[165] MDN, p. 154.

[166] MDN, pp. 188–91.

[167] To date scholars of kabbalah have treated light as its primary religious symbol and made no connection with prevalent scientific theory of perception or the physiology of vision. The best example is Elliot R. Wolfson,

Isaac Ibn Latif continued Jacob ben Sheshet's attempt to present a kabbalistic reading of Genesis as a systematic alternative to the Maimonidean reading. Ibn Latif was in contact with Todros ben Joseph Abulafia of Toledo, to whom he dedicated his *Ṣeror ha-mor*, and with the kabbalists of Toledo. Although he presented himself as a recipient of a living oral kabbalistic tradition of secrets, he also declared himself to be a "faithful disciple of Maimonides" and a critic of his opponents. To explore the differences between Aristotelian philosophy and kabbalah, Ibn Latif composed *Shaʿar ha-shamayim* (The Gate of Heaven) to serve as a guide to the kabbalistic perplexed.[168] He adopted the esoteric and enigmatic style of Maimonides' *Guide*, expressing "extreme reluctance and hesitancy about revealing these secrets to the reader."[169] Familiar with Ibn Tibbon's Hebrew translation of the *Meteorology* and with non-Jewish and Jewish commentaries on the Aristotelian text,[170] Ibn Latif admits that Aristotle's meteorological theories are "plausible opinions" (*sevarot qerovot*) that are closer to the truth than other theories, but notes that they lack demonstrative power. He therefore wonders why Maimonides accepted Aristotle's physics about the sublunar world as "indubitable truth" (*ʾemet beli safeq*). Given his deep admiration of Maimonides, Ibn Latif was ready to deny his own views and accept Maimonides' version, but his commitment to the pursuit of truth and the realization that his own views were "deeply intertwined with the supernal mysteries of Torah" (*ʾaḥuzim be-ḥavlei ha-setarim ha-ʿelyonim ha-toraniyyim*) compelled him to present his alternative to Maimonides' reading of the biblical creation narrative.

Ibn Latif's writings illustrate the degree to which kabbalah was taken to be a scientific discourse about the origins of the universe. The foundation of the kabbalistic science was the metaphysics that took light to be the Form of Corporeity. This "spiritual light" (*ʾor ruḥani*) was seen as an infinite, simple, and pure substratum of reality that could not be studied, perceived, or comprehended. The first three sefirot – will, universal matter, and universal form – which are also identical with the three cosmic elements of SY, fire, spirit, and water, emanated from this light. This spiritual light is also the essence of the Hebrew letters out of which the world is constructed. The complex details of Ibn Latif's philosophy of light require a separate study; for our purpose it suffices to note that it has much in common with the views of Grosseteste, because they both derived their ideas from Solomon Ibn Gabirol and his Ismaili sources, especially Hamid al-Din al-Kirmani (d. ca. 1021). Sara Heller Wilensky has documented Ibn Latif's indebtedness to Ibn Gabirol and other Jewish Neoplatonists of the eleventh century, such as Abraham Bar Ḥiyya, Moses Ibn Ezra, Abraham Ibn Ezra, and Joseph Ibn Zaddik,[171] who were rejected by Ibn Daud and Maimonides. I believe (without being able to prove it here) that Ibn Latif's philosophy of light provided the scientific theory behind the letter mysticism of the Zohar. In short, kabbalistic cosmic semiotics and linguistic ontology were not just fanciful rhetorical flourishes, but rather a full-fledged scientific and philosophical theory about light, matter, form, creation, and emanation, derived from a variety of intellectual traditions, notably SY and the Ismaili version of Neoplatonic cosmology as reworked by Jewish philosophers in the eleventh and twelfth centuries.

"Hermeneutics of Light in Medieval Kabbalah," in Matthew T. Kapstein, ed., *The Presence of Light: Divine Radiance and Religious Experience* (Chicago: University of Chicago Press, 2004), pp. 105–18. To go beyond the unpacking of symbolism requires a detailed study of the scientific theories utilized by the kabbalists, which I intend to undertake.

168 Sara Heller Wilensky, "The Guide and the Gate: The Dialectical Influence of Maimonides on Isaac Ibn Latif and Early Spanish Kabbalah," in *A Straight Path*, pp. 266–78.

169 Ibid., p. 269.

170 See Isaac ben Abraham Latif, *Ṣurat ha-ʿolam*, ed. Zalman Stern (Vienna, 1860), p. 6.

171 Heller Wilensky, "Isaac ibn Latif: Philosopher or Kabbalist," in Alexander Altmann, ed., *Jewish Medieval and Renaissance Studies* (Cambridge, MA: Harvard University Press, 1967), pp. 185–223, on pp. 200–1.

CONCLUSION: KABBALAH AND THE INVOLVEMENT OF JEWS IN NATURAL SCIENCES

In examining the dialectical relationship between kabbalah and science in the Middle Ages, I made several related arguments. First, to assess the relationship between kabbalah and science, we need to appreciate the ambiguity of the term "science" and realize how it was understood by various schools of thought among medieval Jews. Second, kabbalah adhered to the Platonic conception of scientific knowledge rather than to the Aristotelian view, which gradually became dominant among Jewish intellectuals during the thirteenth century. Third, during the thirteenth century, kabbalists were neither "antiscience" nor ignorant of the Aristotelian science of their day. Rather, they believed that empirical Aristotelian natural philosophy was on a lower epistemic level than the knowledge they possessed of the sefirot and the Hebrew letters. They viewed the sefirot, functioning as the archetypal paradigms of the universe and the structural principle of all levels of existents, as the first principles that govern all processes in the physical world, account for the occult properties of things, and serve as the final causes of all things. As the elemental units or "building blocks" of the universe, the Hebrew letters and their infinite permutations contain the secret code of the created universe, which the scientist seeks to obtain. As far as the kabbalists were concerned, its understanding of the sefirot and of the Hebrew letters makes kabbalah the highest form of (scientific) knowledge accessible to humans or, more precisely, to the Jews, and especially the Jewish (male) kabbalists. For the kabbalists, kabbalah consisted not only of a deeper and truer interpretation of Scripture and rabbinic midrashim but also of a more accurate grasp of the way things are; namely, a more precise (scientific) knowledge of reality.

The modern intellectual historian may wonder, then, whether kabbalah hindered or promoted the study of the natural sciences among Jews in the Middle Ages. The answer is by no means simple or straightforward and goes back to the ambiguity of the term "science," noted at the beginning of the chapter.[172]

If by "science" we mean a naturalistic and inner worldly attitude to the phenomena of nature, as embodied notably in the Aristotelian tradition, then kabbalah probably hindered Jewish interest in the natural sciences. First, kabbalah did not consider the sensible physical world to be ultimate reality. What is real is not the physical universe accessible to the senses, but the intelligible world of spiritual entities accessible only through a contemplative experience (*hitbonenut*). The corporeal world of nature only mirrors the divine; given the low status of empirical knowledge in the ontological order, empirical knowledge of the sensible world is not scientific. So even though the kabbalists were attentive to a whole array of physical phenomena, they did not value the physical world for its own sake and did not consider knowledge of physical things to have moral and religious value in the pursuit of perfection. Furthermore, the very materiality of the sensible world is a source of error and even evil. At best, the material world should be spiritualized through observance of the commandments, thereby transcending its material limitation. Such a negative attitude toward the physical world is not conducive to interest in natural phenomena.

Instead of the study of natural phenomena, kabbalah promoted the study of Torah, the divine text that best guides the Jews toward understanding God and the created world. Because God is the Infinite and because the primordial Torah is one of God's attributes, the revealed Torah has infinite meanings; understanding them is the goal of Jewish life.[173]

[172] For a further discussion of kabbalah's complex attitude toward nature, see Hava Tirosh-Samuelson, "The Textualization of Nature in Jewish Mysticism," in idem, *Judaism and Ecology: Created World and Revealed World* (Cambridge, MA: Harvard University Press, 2004), pp. 389–404, esp. pp. 390–6.

[173] See Moshe Idel, "Infinities of Torah in Kabbalah," in Geoffrey H. Hartman and Sanford Budick, eds., *Midrash and Literature* (New Haven: Yale University Press, 1986), pp. 141–57.

For the kabbalist, the holy life does not revolve around the study of natural phenomena but around the endless interpretation of the sacred text and the infinite permutations of the divine name. This hermeneutic activity was enhanced by the Zohar, which presented itself as the revelation of the cipher required to decode the Torah. Based on the linguistic mysticism prevalent in thirteenth-century kabbalah in Castile, the Zohar articulated a "discourse on the mystical nature and emergence of the letters of the divine names as well as on the process of genesis in general," thereby spelling out the grammar of reality quite literally.[174] In the early fourteenth century, the Zohar itself became the focus of study and further interpretations that had little to do with the empirical study of the natural world. Consequently, it reinforced the kabbalistic preoccupation with the sacred text, adding yet another linguistic veil that the kabbalist was supposed to penetrate. The primacy of the text in Jewish life would render the kabbalists less and less interested in observing natural phenomena.

Finally, not only did kabbalah make the sacred text the texture of Jewish life, but it also textualized nature. Nature itself is constructed of the Hebrew letters, the basic units of information whose endless combinations mysteriously give rise to physical reality and all forms of life. The view of the physical world as a symbolic text makes kabbalah closer to modern information science than to the natural sciences in the Aristotelian schema. The textualization of nature made kabbalistic discourse rich in symbolism derived from plants, but it did not make kabbalists interested in the study of nature, nor did it encourage them to appreciate the natural world for its own physical properties. It was precisely the physical reality of natural things that the kabbalists claimed to transcend and decode.

Nonetheless, the very claim that kabbalists possess the linguistic code of the natural world empowered them to control and manipulate nature. Presumably, those who mastered the theory could decode the mystery of nature and harness its occult power for their own use. In the fifteenth and sixteenth centuries, when kabbalah absorbed (from non-Jewish and non-Hebrew sources) the vast alchemical tradition into its own symbolic system, the practice of kabbalah was closely aligned with magic. The magical interpretation of kabbalah not only made kabbalists interested in the study of magic, alchemy, and astrology but also raised their esteem among non-Jewish scientists, who were beginning to move from the Aristotelian view of the sciences and experiment with nature.[175] As a magus of the divine Word, the kabbalist used verbal technology to effect changes in the natural world, heal the sick, help women in childbirth, and avert natural disasters. The fascination with the linguistic secrets of nature among Jews and non-Jews of the Renaissance was quite different from both the Aristotelian view of science and the modern notion of quantifiable science, but this fascination showed that kabbalists were not oblivious to knowledge of the natural world. According to this reading of kabbalah (but the issue remains controversial), the practice of magic was not necessarily the opponent of science but the precursor to and facilitator of the rise of modern experimental science.

[174] Wolfson, "Letter Symbolism and Merkavah Imagery in the Zohar," p. 224.

[175] For a further discussion of kabbalah and the natural sciences in the early modern period, see David Ruderman, *Kabbalah, Magic, and Science: The Cultural Universe of a Sixteenth-Century Jewish Physician* (Cambridge, MA: Harvard University Press, 1988); Hava Tirosh-Samuelson, "Theology of Nature in Sixteenth-Century Italian Jewish Philosophy," *Science in Context* 10(4) (1997): 529–70.

24

History, Language, and the Sciences in Medieval Spain

Eleazar Gutwirth

The intense involvement of the Jews in science in medieval Iberia was affected by various historical settings and factors, which partly conditioned the production of knowledge by Jews there between the tenth and the fifteenth centuries.

There has always been some desire to relate the production of knowledge to history rather than discussing it in a vacuum. Early attempts to explain the Jewish involvement in the sciences in medieval Spain saw it as part of a struggle between Enlightenment and obscurantism.[1] Later these forces were replaced by Pietism versus Averroism.[2] Many have attempted to situate intellectual history within the framework of overarching processes such as the (sometimes unexamined) concept of the Reconquista and the movement of Jews between Muslim and Christian Spain.[3]

[1] The more widely read and influential version of Graetz's *History* is that in English (*History of the Jews, from the Earliest Times to the Present Day,* ed. and trans. Bella Löwy [London, 1891–2]), where we find almost at random (Vol. 3, ch. 15, p. 547) that on the one hand, there was (in the thirteenth century, ca. 1232) the "proscription of science." On the other hand there were the "Maimunists" who "rose in arms against the Obscurantists." Such binary notions seem to have been held by other writers as well. See for example Zweifel's prologue in Shem Ṭov Ibn Shaprut (fl. 1375–80), *Pardes rimmonim: ʿal haggadot ha-talmud* (Zhitomir, 1866). I. Husik, the historian of medieval Jewish philosophy, believed that in the fifteenth century the "scientific devotees were the first to yield and many of them abandoned Judaism. Thus it was that mysticism and obscurantism took the place of Enlightenment as a measure of self-defense" (*A History of Mediaeval Jewish Philosophy* [New York: Atheneum, 1969], p. 429). This history was first published in 1916 so that it could not have been influenced by Baer. Guttmann acknowledged the significance of locale (Julius Guttmann, *Philosophies of Judaism: The History of Jewish Philosophy from Biblical Times to Franz Rosenzweig,* trans. David W. Silverman [New York: Schocken Books, 1964]). Spanish Jewry was for him "the foremost bearers of Jewish philosophy." But although there is a desire to see history as a factor, (fifteenth-century) history is reduced to "frightful pressure" (p. 275), Tortosa (p. 281), and "breakdown of Jewish life in Spain" (p. 291). This is the historical frame of a philosophy condemned as eclectic. The "eclectic" charge is as old as Zunz, but it is still occasionally voiced today. The other, opposing, side is "a definite tendency toward orthodoxy" (p. 275). Werblowsky has argued that Guttmann had a philosophical agenda of his own, one that was highly influenced by Husserl and one that markedly colored his *Philosophies of Judaism.* See R. J. Z. Werblowsky, "Introduction," ibid., pp. vii–x.

[2] On the theory of a Hispano-Jewish Averroism as a factor in the history of science, see, among numerous other supporters, L. Garcia Ballester, L. Ferre, and E. Feliu, "Jewish Appreciation of Fourteenth-Century Scholastic Medicine," *Osiris* 6 (1990): 85–117; F. Marquez Villanueva, "Nascer e morir como bestias (criptojudaismo y criptoaverroismo)," in Fernando Díaz Esteban, ed., *Los judaizantes en Europa y la literatura castellana del Siglo de Oro* (Madrid: Letrúmero, 1994), pp. 273–93.

[3] Recent work tends to emphasize the literary quality of this concept: Deyermond studied some of the precise techniques for achieving this purpose, particularly the use of New and Old Testament models and images in

At some levels, language has always been a part of the study of the history of science and philosophy among the Jews. Such study has always depended on inquiries into translations from one language into another, which usually led to questions about whether the overall framework of scientific ideas current among the Jews was Latin Scholasticism, Arabic texts, Hebrew translations, or something else.[4] Similarly, the texts – with some notable exceptions – have survived in manuscripts that had to be identified and described before they could become the object of scholarly attention. Most frequently such long and arduous labors were carried out as part of the cataloguing process of great libraries and collections, which saw language as a primary classification category and science as a secondary category. Thus, numerous nineteenth- and twentieth-century catalogues are devoted first to Hebrew (or Hebrew-character) manuscripts and only then categorized according to subjects, including the sciences, rather than the other way around. The history of science among the Jews has traditionally paid attention to some aspects of history, language, and context.

The focus of this chapter is on a less overarching history, as I try to show how several specific aspects of history and geography impinge on work in the history of science. Science and place are linked: We associate Jewish involvement in the sciences with places like Barcelona, Toledo, and Saragossa, but not with, say, Oña, Cobeña, or San Martín de Valdeiglesias, even if there are occasional exceptions and surprises. Similarly, language is more than an important category of cataloguing; there are chronological differences, for example. Medieval scholars did not see languages as transparent media or interchangeable equivalents, nor did they silence their perspectives on the question of language. In medieval Spain, alongside developing the obvious linguistic skills and creating particular technical vocabularies, scientists and philosophers elaborated discourses on languages and the differences between them or within them. These ideas were sometimes linked with geography and history – place and date. Place, date, and language and their link to scientific texts are worth observing in this period of intense Jewish engagement with philosophy and science.

All these factors are at work before the scholar finished the product that is the usual object of study: the completed volume of science/philosophy. What is the framework of such productions in societies that, for the most part, functioned outside institutional systems such as the university? One such framework is the family or dynasty. Dynastic factors operate in various ways. They influence the opportunity for – and investment in – transmission not only of skills such as education and languages but also of books, instruments,[5] and libraries in certain languages. At times, these transmissions coincide with other dynastic professional continuities and specific professional spaces where certain languages and areas are privileged, such as the well-documented service at royal courts, in the courts of nobility, and – less well known – service to town councils as well as the links to scribal and notarial offices.

historiographic and other texts. See A. D. Deyermond, "The Death and Rebirth of Visigothic Spain in the Estoria de España," *Revista Canadiense de Estudios Hispánicos* 9 (1985): 345–67.

4 Moritz Steinschneider, *Die hebraeischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893; repr. Graz, 1956). Other methodological models include Gad B. Sarfatti, *Munaḥei ha-matematiqah ba-sifrut ha-maddaʿit ha-ʿivrit šel yemei ha-benayim* (Jerusalem: Magnes, 1968).

5 For example, there are, of course, astronomical tools that have survived from the Jewish communities of medieval Spain. If it can be shown that instruments (and not only ideas or concepts) are central to scientific endeavor, my point becomes clearer. A classic case that, although frequently studied in some contexts still needs further attention in light of recent archival discoveries, is that of David Bonjorn who makes this centrality explicit: "Books and instruments . . . those which I hold most precious . . . and they could hardly have found a better means of coercing me than to deprive me of these things which in the light of my interests and desires and my longing for them are my most cherished possessions" (Yitzhak Baer, *A History of the Jews in Christian Spain,* trans. Louis Schoffman [Philadelphia: Jewish Publication Society, 1961–6], 2: 18).

Another complex of problems that have an impact on the finished "original" work has to do with the producers of translated scientific texts. It is well known that numerous "original" works are unthinkable without taking account of the translations that preceded them. Translated texts were not seen as mere "transpositions" of an immutable content from one language to the other, but rather as partly new texts in which the translator intervened creatively. One might then ask: How radical is the distinction between the author and the translator? What did the medieval translators themselves think about their role? These questions point to the issue of who or what is an author in a particular culture and what are the representations of authorship.

Alongside such factors, which precede and condition the work of science – linguistic attitudes, dynastic orientation, libraries, and views about translators and authors – the socialization of knowledge in particular cultural communities also precedes the finished work of science. In this chapter, I consider the culturally specific socialization of knowledge as manifested by the emergence of new linguistic media, in the form of the Ibero-Romance languages and of intensified literary genres, such as homiletics, in these languages.

PROLOGUES AND THE HISTORY OF SCIENCE

The link between ideas, history, and geography is most visible in the prologues to philosophical and scientific texts. Although there has been a scholarly tradition devoted to their study since the early work of Steinschneider, prologues were often undervalued because they were believed to be "stereotyped."[6] More recently, there has been a renewed awareness of their possible significance (and of similar spaces for authorial pronouncements) to questions concerning authorship and authorial statements.[7] Frequently, it is in the prologues that we find, for example, the expression of attitudes to a language/culture or to the specific historical circumstances of the work; dates and geographic locations; and cultural images of a region, a language, a religious tradition, or a particular authority. Such textual spaces, although apparently unrelated to the scientific and philosophical themes of the text, may nevertheless provide answers to central questions of authorial representation and are directly relevant to the real history of the study of the texts themselves. Two concrete examples substantiate and clarify this point.

Shem Ṭov from Tortosa was born ca. 1196 and wrote his introduction to the *Sefer ha-Šimmuš* (a translation of Zahrawi's *Kitab al-Taṣrif*) at the age of 58 in 1254. In the manuscript, which is located at the Bayerische Staatsbibliothek in Munich, the prologue consists of about twenty-five folios.[8] That is, it is a text of a certain substance and autonomy. In the prologue, Shem Ṭov writes that his work of producing medical texts in Hebrew is part of a universal long-term project consisting of the human acquisition of knowledge. For him, written texts transcend the oral mode, which is restricted to a specific time and a place. However, he qualifies this universalist stance by reference to a series of particular circumstances. Thus, for example, he tells us that for about twenty years he was engaged in transliterating Arabic works/books of medicine into Hebrew characters, and he argues that this project is specially useful to a particular public: those who read the Hebrew alphabet and know the Arabic language.

6 For the continuity of Steinschneider's views until recently see, e.g., E. Gutwirth, "The Transmission of Rabbi Moses Arragel: Maqueda, Paris, London," *Sefarad* 63 (2003): 69–88.

7 E. Gutwirth, "Actitudes judías hacia los cristianos en la España del siglo XV; ideario de los traductores del Latin," in C. Carrete Parrondo, ed., *Actas del II Congreso Internacional "Encuentro de las Tres Culturas"* (Toledo: Ayuntamiento, 1985), pp. 189–96.

8 For Shem Ṭov see, S. Muntner, "R. Shem Ṭov ben Isaac of Tortosa," *Sinai Jubilee Volume* (Jerusalem, 1957), pp. 321–37 (Heb.).

Shem Ṭov frequently invokes the concept of language. For instance, the physician has to be someone who comprehends language and is soft-spoken. He should spend most of his time reading books of medicine. Like so many others, Shem Ṭov dismisses the word-for-word translation method. He writes that he added and he subtracted from the text he was translating. In the *benevolentiae petitio* section of his prologue, he invokes a certain *humilitas* and expresses the commonplace of his ignorance in both languages, Hebrew and Arabic. He asserts that many have erred in the nomenclature of simples, herbs, and seeds.

Shem Ṭov discusses the difficulties he had to face in translating the text, and he makes us aware of the contingencies in the Hebrew versions of Arabic works of science. For example, the prologue is concerned with setting down the fact that the text of Zahrawi the surgeon exists in various manuscript versions that differ from each other, and Shem Ṭov states that his translation depends on the particular manuscript he is using in his time and place. He also expounds on the theme that his work is conditioned by the target language of the translation (i.e., Hebrew). Here Shem Ṭov develops explicitly the theme of the difficulties in finding, in Hebrew, equivalents for the technical terms of medical theory and practice, such as the nomenclature of simples. He invokes the translations into Arabic where terms for which no equivalent could be found were left in transcribed form in the original language (Greek or Persian). This argument underscores the difficulties facing the translator and his level of expertise; but, more significantly, by emphasizing his own choices and his own labors (rather than Zahrawi's or the Greeks' and the Persians'), Shem Ṭov undermines the radical opposition between author and translator.

This is also the conclusion that may be reached by paying attention to the passages on originality versus plagiarism of translators; in these passages, Shem Ṭov raises questions associated with authorship:

> And behold: while I was engaged in the translation and investigated the writings of the Rabbis (blessed be their memory) and the terms for the organs and their illnesses, for the herbs, vegetables, and remedies, and similar terms which do not appear in the Bible, I also examined the translations of wise, intelligent and erudite translators who had translated books cleverly. And then came others, who changed and inverted their translations and gave their own names to these translations. They thus stole the name of the first authors, who in their translations had brought to light the obscure mysteries. I say that their translations are faulty, and, moreover, that it would have been impossible for them to produce their translations if it were not for the work of the translators whose work they were using. . . . I conjure the reader in the name of the Honorable Name of four letters not to erase or change a single thing in this translation taking away the name and stealing my name from it.[9]

The Tortosi's representation of the translator's role underscores the link between language and science, translation and authorship. There is full awareness here of the manuscript text as specific to a language, a time, and a place; of the investment of labors and competence in translation and its limits; of the specificities of access and lack of access to alphabets (cf. his comments on Hebrew script and the Arabic language, for example); and of the role of different languages (cf. his comments on Persian and Greek, for example, implying that they are the ultimate sources). Shem Ṭov also draws attention to the link between the history of science and of language by pointing to the changes in Hebrew scientific vocabulary over time. He mentions the differences between the pharmacological terms in the Bible, in rabbinic texts, and in his own time. The prologue thus acts as a kind of (proto-) essay that makes public and visible the value of the invisible labors of translation by drawing attention to the difficulties, creative efforts, and investments of the translator. It refutes assumptions of the full equivalence of "original" and "translation."

9 Ibid.

Another thirteenth-century example of pronouncements of an "authorial" type is provided by the Toledan scientist Judah ben Solomon.[10] His work, in addition to items usually considered original (epistles, commentaries), includes the *Midraš ha-ḥoḵmah,* usually described as an encyclopedic work embracing numerous disciplines. Each section has long been studied as part of the history of the particular discipline with which it deals. Here let us pay attention to questions bearing on the work as a whole. One such question is that of self-representation in the public space of the text. Thus, for example, is the location of the author-translator a part of the representation of the author? Does Judah ben Solomon present himself as universal or local?

One answer could be based on noting that Judah refers to "my land," and by that he means Spain. When he described his stay at the imperial court in Tuscany in ca. 1245, he writes, "I pray to the Lord every day that He may return me to my placid and happy land, may thus be his will, amen."

Similarly, the attention to the birthplace and family of the translator within the text of the translation forces the reader to move away from a reading of the text as providing transparent access to a putative original. In the section on judicial astrology – where we would expect a paraphrase of Ptolemy's *Tetrabiblos* – Judah discusses the effects of the stellar conjunction at the time of his own birth.[11] Presenting the Ptolemaic belief that certain astrological conditions at the time of birth allow one to predict speech impediments in the newborn, Judah remarks, "This has happened to me. On the day I was born, my father and master, R. Zisa ben Shoshan, gave this [astrological] judgment."[12] What his father foresaw was that the scientific translator, Judah ben Solomon, would be a stutterer. Judah's paragraph is a gesture of self-representation in which he alludes to his stuttering and connects it to the timing of his birth. The gesture may be more resonant, perhaps, if we remember that his main goal is the communication of knowledge.

In this act of self-representation, Judah tells us not only what his relative said at the time of his birth but also who this relative was. Today such resonances may be reconstructed by research and by attention to archival documents. However, readers of his works in medieval Spain would have understood the resonances of the name of his family without such research. The family had ties to the royal court and appears in the archival documents as profoundly rooted in Toledo and well established there.[13] It is also a family that received grants of land from the king and that therefore appears in title deeds; it is thus connected to the world of notaries recording such documents. An examination of the surviving archival documents written by such professionals leaves no doubt that they were working in Latin, in Arabic, and in Hebrew.[14]

[10] For further references see E. Gutwirth, "Entendudos: Translation and Representation in the Castile of Alfonso the Learned," *Modern Language Review* 93 (1998): 384–99.

[11] J. Shapira and J. Löwe, eds., *ʾOtot ha-šamayim, huʾ Sefer Mišpeṭei ha-koḵavim u-mišpeṭei ha-nolad* (Warsaw, 1866), f. 8b.

[12] See Gutwirth, "Entendudos," for further references.

[13] See ibid. for further references. A theorization of the links between science (physics, medicine, biology) and the construction of the urban image, with emphasis on late medieval Valencia, may be found in J. V. Boira Maiques, "Science, Politics and Image in Valencia: A Review of Urban Discourse in the Spanish City," *Cities* 20(6) (December 2003): 413–19.

[14] E. Gutwirth, "Toledo, circa 1320: Los judíos y el Arabe," in C. Carrete Parrondo and Alisa Meyuhas Ginio, eds., *Creencias y culturas* (Salamanca: Universidad Pontifica de Salamanca UTA, 1998), pp. 97–112. Alongside the notarial factor there are other possibilities as well. The persistence of Arabic language and culture among the Mozarabs has long been a traditional theme of Toledan historiography. Such a historiography has tended to concentrate on the liturgical aspects. More recently, nonliturgical areas have been the focus of research. See for example Diego Adrian Olstein, *La era mozárabe: Los mozárabes de Toledo (siglos XII y XIII) en la historiografía, las*

When Judah ben Solomon includes in his "Ptolemaic" text an allusion to his ancestry, he dispels the illusion of the transparency of the translator and draws attention to more authorial aspects. Judah's text can also be examined from the point of view of other aspects of authorship. His Hebrew texts include noteworthy examples of intertextuality with the Bible and the Talmud. Such passages confront the reader with Judah's own universe of discourse, and not with the original Greek, Syriac, or Arabic sources or predecessors. Thus, the reader is not confronting a "mere" translator, but rather a creator of his text, so that the question of author vs. translator faces us at the most basic levels. In addition to the very long duration of the project of the history of science and philosophy (i.e., translating a work more than a millennium after its writing), specific historical and cultural factors are also at work in the particular philosophic or scientific text: Ptolemy did not cite the Hebrew Bible and did not synthesize talmudic statements and the science of the stars; in such passages it is Judah ben Solomon himself who exposes his own ideas, and the translator operates as an author.

Alongside self-representation and intertextuality, pronouncements of an authorial type in a translation express a third type of individual attitude; for example, statements in which the translator actively and publicly introduces his disagreements with the author whose work he is translating. Judah ben Solomon is a case in point. He introduces his disagreements in the astrological part of his work, in a section dealing with the character of the peoples born in different regions/climes. Judah "translates" the passage in the *Tetrabiblos* in which Ptolemy affirmed that the inhabitants of Syria, the Land of Israel, and neighboring regions are "dishonest " and then inserts a long pronouncement containing critiques of Ptolemy's claim. Among other things, he argues that Ptolemy is motivated by his own subjective circumstances – that is, his own birthplace. Leaving aside the question of subjectivity in the scientific text of Ptolemy, it may be recalled that the influence of the stars on the character of peoples/climes is more than an occasional, marginal theme in such scientific texts (be they Greek, Hellenistic, Arabic, Hebrew, or Latin). The problem of climes is not restricted to this concrete section of *ʾOtot ha-šamayim.* It is part of a vast literature that is frequently concerned with this issue of climes. Because these ideas on climatology are so deeply rooted and part of various mainstream cultures, they have attracted a number of scholarly treatments, although none on Judah ben Solomon.[15] It is precisely on this point

fuentes y la historia (Salamanca: Universidad, 2002). It reviews the historiography on the nonliturgical culture of Toledan Mozarabs and suggests further lines of research on acculturation.

[15] Another scientist with proven contacts with Iberian Jewish culture, Amatus Lusitanus, also criticizes, more than once, the climatological theory. He does this clearly with reference to assumptions about black slaves in Rome. Yet he also undermines the very character of climatology as science when he uses it in an epideictic, almost ironic, fashion to praise Castello Branco, his own native village. This epideictic (and therefore rhetorical, forensic rather than scientific or astronomical) dimension does not seem to have been noticed. For Amatus see E. Gutwirth, "The Locations of Sixteenth-Century Cultures," in David B. Ruderman and Giuseppe Veltri, eds., *Cultural Intermediaries: Jewish Intellectuals in Early Modern Italy* (Philadelphia: University of Pennsylania Press, 2004), pp. 216–38. For further references and comments on the concrete case of translations in thirteenth-century Castile and Judah ben Solomon's *ʾOtot ha-šamayim,* see Gutwirth, "Entendudos." See also David N. Livingstone, *The Geographical Tradition* (Oxford: Oxford University Press, 1993); Howard Kreisel, *Prophecy* (Dordrecht: Kluwer, 2003); Jonathan Schorsch, *Jews and Blacks in the Early Modern World* (Cambridge: Cambridge University Press, 2004). Most treatments follow on the by now classic work of A. Altmann, "Torat ha-ʾaqlimim le-R. Yehudah ha-Levi," *Melilah* 1 (1944): 1–17. More recent work on maps in the Middle Ages with specific reference to Spain seems to emphasize the perceptions of regions and places as allegorical, symbolic, fantastic, religious, etc. See P. Luis Huerta and J. L. Hernando, eds., *Viajes y viajeros en la España medieval* (Aguilar de Campoo and Madrid: Fundación Santa María La Real, Centro de Estudios del Románico, 1997). For scholars who do not think that these climatological ideas are "occasional" or "marginal," see for example G. H. T. Kimble, *Geography in the Middle Ages* (New York: Russell & Russell, 1968); M. J. Tooley, "Bodin and the Medieval Theory of Climate," *Speculum* 28 (1953): 64–83; Z. Fink, "Milton and the Theory of Climatic Influences," *Modern Language Quarterly* 2 (1941):

that the translator, Judah ben Solomon, chooses to challenge Ptolemy, the author whom he is translating.

THE LOCAL CONTEXT: THE TOLEDAN CASE

Particular regional, political, or social contexts affect the finished scientific texts. Here, in an example from the area of Toledo and the royal court of Castile, we consider the case of Judah ben Solomon's contemporary, Judah ha-Kohen ben Mosca, whose works include the *Lapidarios*, written under the patronage of Alfonso X of Castile and Leon (1221–1284). Again, we have an author concerned with subjects that pertain to the history of science – mineralogy, astrology, and perhaps pharmacology. The significance of the link to Toledo is understood once we attend to the claim made in the prologue, that although the book had been lost Mosca nevertheless managed to obtain it in that very city: "ouol en Toledo de un iudio."[16]

Moreover, the local context comes to the fore in the Alfonsine Tables. The prologue uses the meridian of Toledo. This choice is not presented in the text as a consequence of its being a "capital of Spain"; instead, Toledo is described as one of the principal cities of Spain. Rabiçag (i.e., R. Isaac) and Mosca write: "May the Lord guard her." Within the panegyric to the king, we find the idea that Toledo is an apt choice because it is the birthplace of King Alfonso.[17] The Tables are linked to that intellectual "model" chosen by the thirteenth-century scientists (e.g., Azarquiel). Another text from these circles, also a prologue, is at the beginning of the Romance version of the *Tratado de la Azafea*. It describes Azarquiel as "the sage, astronomer *of Toledo*," although Azarquiel had also worked elsewhere. The astronomical work (*Azafea*) is presented as having been achieved "a ondra del rey Almemun": in honor of King Almemun. The thirteenth-century prologue adds this phrase: "who was *then* lord of that city."[18] As elsewhere in the Alfonsine corpus, the reader is left to make the inference that it is appropriate to offer such a work to the king who is now lord of that city. The author of *Yesod ʿolam*, in a paragraph devoted to Azarquiel, similarly leaves the reader in no doubt about his belief in the links between locality and science: Azarquiel worked on the construction of instruments that were commissioned by the Jewish and Muslim scholars of Toledo. Afterward Azarquiel became a kind of teacher of the scholars of Toledo.[19] The texts of the period, then, present the work of science as linked to contingencies of time and place.[20]

67–80; A. Lovejoy and A. Boas, *Primitivism and Related Ideas in Classical Antiquity* (Baltimore: Johns Hopkins University Press, 1953). All of these studies are mentioned by A. Melamed in his "Ereṣ Yiśraʾel we-ha-teʾoryah ha-ʾaqlimit ba-maḥšavah ha-yehudit," in Moses Halamish and Aviezer Ravizky, eds., *Ereṣ Yiśraʾel ba-hagut ha-yehudit bi-ymei ha-benayim* (Jerusalem: Ben-Zvi Institute, 1991); Abraham Melamed, *The Image of the Black in Jewish Culture: A History of the Other* (London: Routledge, 2002), pp. 52–78. On climate theories, see also Nehemya Allony, "The Reaction of Moses Ibn Ezra to 'Arabiyya,'" *Bulletin of the Institute of Jewish Studies* 3 (1975): 19–40.

16 R. C. Diman and L. W. Winget, eds., *Lapidario and Libro de las formas & ymagenes* (Madison: University of Wisconsin Press, 1980), f. i^v, line 10.

17 The texts have been published on numerous occasions, indeed too many to be mentioned in full. See now their reedition in José Chabás and Bernard R. Goldstein, *The Alfonsine Tables of Toledo* (Dordrecht: Kluwer, 2003), p. 22 (sentence 1:19).

18 J. M. Millás-Vallicrosa, *Estudios Sobre Azarquiel* (Madrid and Granada: CSIC, 1943–50); Roser Puig Aguilar, *Los tratados de construcción y uso de la azafea de Azarquiel* (Madrid: Instituto Hispano-Árabe de Cultura, 1987).

19 See Millás, *Estudios Sobre Azarquiel.*

20 A different – but linked – question is that of the representation of science and place in fiction. There are various examples, but the best-known case is probably the link between Toledo and magic in the story told (in King Alfonso's family) about Don Illán, the "magus" of Toledo, because it has served as inspiration for twentieth-century reworkings (e.g., by J. L. Borges). See the analysis by A. M. Diz, "El mago de Toledo: Borges y Don Juan

Here again, we might ask this question: What is the intersection between history and science? Despite more than a century of research on the *Lapidario* (perhaps the most reedited of Judah Mosca's works), the sources of this work have not been clearly established.[21] Judah's connections and contacts with Christian Iberian, Italian, and English scholars are far better documented than those of the author of the *Midraš ha-ḥokmah*. Readers have tended to notice presences – that is, ultimate antecedents – rather than immediate sources. Recent work has focused on less hypothetical aspects, such as the basic incontrovertible element that is patronage and a rhetoric of patronage and courtly concerns.

Another aspect relates to the translator's perception of his own role; namely, the emphasis he puts on authorship rather than mediation. Various examples have been discussed elsewhere,[22] and here some other examples may be added. In the *Lapidario*, under the sign of Gemini, in the discussion of gold, Judah Mosca writes, "ayuda para muchas cosas en el arte de fisica que no conuiene decir todas en este lugar;" and again: "el que este libro conpuso dijo."[23] The translator here clearly intrudes into the text: He decides what is "conueniente" and what is not, what to cite from the words of "el que este libro conpuso" and what to leave out.

Mosca is also linked to the *Libro de las tablas alfonsies* coauthored by Yehuda fi de Mose fi de Mosca and Rabiçag Aben Cayut (i.e., Isaac Ibn Cid). This work asserts that calendars begin from the date of an event that people of each "nation" think is significant. Excluding the Jews from his list, he cites as examples of "naciones" and significant events in their respective histories, first the Greeks (Alexander), then the Romans (Caesar), the Arabs (Árabes/Moros; Muhammad), and the Persians (Yezdager). Therefore, Judah ben Mosca–Ibn Cid may be said to construct the analogies (Alfonso is like Alexander, Caesar, Muhammad, and Yesdager) and assert that the era of the Tables should begin with Alfonso so that he may be remembered. Far from being invisible, passive, vehicular entities, the translators/authors present themselves rhetorically as being in control of the calendar in the kingdom. They intervene on the issue of the calendar, which is not a purely numerical issue, but rather involves questions of what is significant for a "nación." Their work on the "eras" is directly and explicitly related in the panegyric to the notion of the greatness of the king, their patron.

Midraš ha-ḥokmah, the *Lapidarios*, *Tablas*, *Azafea*, and the works of the Israelis are only a few of the possible examples of scientific work and translations rooted in Iberian, at times specifically Toledan, Jewish history, long after the age of Bishop Raymundus in the twelfth century. In the following centuries, Toledo continues to be emblematically associated with translation, science, and Jews. In the eighth of his *Maḥbarot*, the poet Immanuel of Rome (1270–1330) constructs a scene where there arrives in Italy a chest of books from Toledo, and the reader can feel the excitement with which these books are awaited. In the fifteenth century, it is in Toledo – during a visit there in 1422 – that the Grand Master of the Order of Calatrava conceives his project of having the Bible translated from Hebrew into the Romance of Castile, and he writes a letter to this effect directed to the Rabbi Moses Arragel. In 1504, it is during a visit to Toledo that Cardinal Cisneros conceives the project that would lead to the Complutensian Polyglot – another work linked to translations that engaged converts from Judaism who spent a great deal of time obtaining and copying medieval Hispano-Jewish

Manuel," *Modern Language Notes* 100 (1985): 281–97. For magic among scientists such as Arnau de Vilanova, see L. García-Ballester, "Dietetic and Pharmacological Therapy: A Dilemma among Fourteenth-Century Jewish Practitioners in the Montpellier Area," in W. F. Bynum, ed., *Essays in the History of Therapeutics* (Amsterdam: Editions Rodopi, 1991), pp. 23–38.

21 For a critique of source studies see S. Rodriguez Montalvo's introduction to her edition of Alfonso X, *Lapidario* (Madrid: Gredos, 1981).

22 See Gutwirth, "Entendudos."

23 Maria Brey Marino, ed., *Lapidario* (Madrid: Castalia, 1968), p. 65.

manuscripts for this enterprise.[24] Another relevant case is that of Abraham Ibn Naḥmias, who translated and wrote a commentary of a work on Aristotle's *Metaphysics.* He has been recently identified with the Abraham Ibn Naḥmias who is documented in archival records as working in Ocaña in ca. 1490.[25] He too belongs to the Toledan context. To understand the particular cultural resonances of the ties uniting Ocaña and Toledo, attention may be focused on the representation of such ties in Lope de Vega's *Peribáñez.* [26] In this text, neither Ocaña nor Toledo is represented as mere postal addresses. They lead to – and explain – the actions of the characters. The representation unites them not only by pure geography but also by cultural directions; in this particular case religious beliefs.

THE RECONQUISTA AND LANGUAGE

We now turn to another dimension of the scientific practice of Jews of Toledo; namely, their pronouncements on and attitudes to specific languages. There was a certain tradition of expanding on the theme of languages in scientific works of the thirteenth century, as has been shown (Ṭorṭosi, Mosca, and others). Leaving aside the more spectacular phenomenon of the rise at this date of the Romance vernacular as a vehicle of science, we can turn to the question of continuity in the late Middle Ages by examining another case: the controversy between Israel Israeli and Asher ben Yeḥiel (late thirteenth and early fourteenth centuries).[27] The exchange has served historians since the nineteenth century as a kind of platform for expatiating on the characteristics of Sephardi versus Ashkenazi culture, on the faith-versus-reason question, on simple piety versus sophisticated philosophy, and on various other questions. Whatever the merit of these construals, we clearly have here a fourteenth-century Toledan polemic about language and translation: Israeli explicitly articulates his views about language and so does Asher ben Yeḥiel.[28] Asher also expresses his views about Arabic, stating that it is apt for certain endeavors but not for others. It should also be pointed out that Israeli translated for Asher Maimonidean texts from Arabic into Hebrew in such areas as the calendar. The survival of Arabic erudition in Toledo of the early fourteenth century puts to rest notions about the Reconquista or the Almohad invasion as having caused a divorce or separation between languages, texts, or cultures.

[24] For this perspective on Immanuel, see Gutwirth, "Entendudos"; for Arragel, see Gutwirth, "The Transmissions of Rabbi Moses Arragel"; for the Complutensian Polyglot, see, e.g., Luis Díez Merino, ed., *Targum de Job* (Madrid: CSIC, 1984).

[25] Gutwirth, "Actitudes judías."

[26] More precisely, the devotion, in the "Kingdom of Toledo" to San Roque (who, incidentally, is frequently associated with pharmacology, medicine, cure of the plague); Lope de Vega, *Peribáñez,* ed. T. Ferrer (Barcelona: Planeta, 1990), Act II, Scene 1, lines 16–26: "Y cierto que, pues que toca / a todos un mal que daña / generalmente, que es poca / devoción de toda Ocaña, / y a toda España provoca, / de nuestro santo patrón, / Roque, vemos cada día/ aumentar la devoción / una y otra cofradía, / una y otra proceión / en el reino de Toledo." The question of Iṣḥaq de Leon's sojourn there may deserve separate treatment.

[27] Biographically one must not confuse Israel ben Joseph Israeli with Isaac Israeli, the author of the *Yesod ʿolam* dedicated to Asher ben Yeḥiel. However, both evidently issued from the same family and historical milieu. It is this aspect of family dynasty that I emphasize here that seems to be confirmed by attention to the libraries and ownership of Arabic works of science. It has been shown by Pieter Sj. van Koningsveld that a large proportion of scientific manuscripts from Spain surviving today in Arabic had some contact with peninsular Jews either as copyists, or translators, or owners: "As far as one can tell from the materials preserved, the Arabic medical and scientific MSS of Christian Spain almost exclusively circulated in Jewish circles." The Israeli family is prominent among these "Jewish circles." A random example is furnished by Appendix XXII of Koningsveld's supplementary notes. It concerns an Arabic MS preserved at the Escorial that mentions members of the Ibn Shoshan and Ibn Waqqar dynasties, but there is also an owner's entry: "Yahuda son of Salama Ibn . . . al-Israili." See Pieter Sj. van Koningsveld, "Andalusian-Arabic Manuscripts from Medieval Christian Spain: Some Supplementary Notes," in Martin Forstner, ed., *Festgabe für Hans-Rudolf Singer* (Frankfurt am Main: Peter Lang, 1991), pp. 811–24.

[28] Some of these readings are discussed in Gutwirth, "Toledo, circa 1320."

Scholarship concerning the literatures of fourteenth-century Spain has devoted much attention to certain works in the Romance and in Hebrew of the polyglot author, Shem Ṭov Ardutiel de Carrión de los Condes. Shem Ṭov makes his vision of the Arabic language explicit in only one text, which has not been the object of such repeated attention: This text is his own Hebrew prologue to the Hebrew work *Miṣwot zemaniyyot.* There is now no longer a need for speculations on fourteenth-century attitudes to Arabic. Shem Ṭov refers to Toledo – that is, Toledo of the first half of the fourteenth century, more than two centuries after its "reconquest" – as a place where Arabic is still current and where Arabic texts (in this case halakhic texts) are still being read. He differentiates between the knowledge of languages in different regions (*gevulot*) of Christian Spanish kingdoms. The old rhetoric of *mizraḥ* and *maʿarav,* of Edom and Ishmael, has been partly superseded.[29]

According to one explicit testimony, that of a firsthand observer of the fourteenth century – Shem Ṭov Ardutiel – then, Judeo-Arabic culture in Toledo had not been wiped out with the invasion of the Almohads, nor had there been a complete shift to a completely new cultural environment at the time of the battle of Las Navas de Tolosa (July 16, 1212), a conventional turning point of the Reconquista. This is the age of Arabizing scientific works (in Arabic or in Hebrew) of the Ibn Waqqars, of the Asherides, of Ḥayyim of Briviesca (mentioned as a source by Zacut, as is Judah ben Asher), and various others. It is also the time of the revival of interest in a scholar/scientist/philosopher highly imbued by the cultures of Al-Andalus, Abraham Ibn Ezra, as evinced in the increase in supercommentaries on his biblical commentaries. An examination of the cultural practices of patronage and translation of Iberian Jews and of evidence concerning copying and possession of Arabic manuscripts in the period after Shem Ṭov de Carrión confirms his perceptions.

In 1981, attention was drawn to a variety of independent pieces of evidence for the models of the culture of the period. Manuscripts at the Bibliothèque nationale de France in Paris (héb. 1009, 1100) contain texts in Arabic (Middle Commentaries by Averroes, *Almagest*) in Hebrew characters commissioned by patrons or copied by Jews in the fifteenth century.[30] Once these individuals are identified – for example, by attention to archival records – we begin to realize that these are not the reading practices of obscure, marginal individuals. Confrontation with the archival documents shows that their names are those of well-established Aragonese Jewish families. Attention was also drawn to Hebrew manuscript Add. 482 at the Cambridge University Library, an originally Arabic arithmetical/mathematical work – highly appreciative of scholarship in Arabic – which was the object of the scholarly efforts of Isaac Alḥadeb. Primary sources of the period show that he was a member of the circle of the great rabbinical authority of the period, R. Isaac bar Sheshet. It did not support the view that centuries after the Almohad invasion, Hispanic Jews had ceased to be interested in Arabic culture.[31]

Such an interest could be documented not merely in the Muslim kingdom of Granada where Arabic was the language of the rulers and where Saʿadyah Ibn Danan was reading

[29] The bibliography on this polyglot author is very large and not particularly relevant here. For the notion that Shem Ṭov reflects the age of Averroism, see the introduction by Y. Nini to his and Maya Fruchtman's edition of *Maʿaśeh ha-rav* (Tel Aviv: University of Tel Aviv, 1980). For the question of his writings about language, translation, and Arabic, see E. Gutwirth "Oro de Ophir: el árabe y Don Shem Tov de Carrión," *Bulletin of Hispanic Studies* 67 (2000): 275–86. See also Eleazar Gutwirth, "The Solitudes of the Hapax-Legomenon: On Shem Tov de Carrion," *M.E.A.H.* 55 (2006): 157–69.

[30] E. Gutwirth, "Hispano-Jewish Attitudes to the Moors in the Fifteenth Century," *Sefarad* 49 (1989): 237–62.

[31] E. Gutwirth, "Hebrew Letters – Hispanic Mails: Jewish Communications in Fourteenth-Century Aragon," in S. Menache, ed., *Communication in the Jewish Diaspora in the Pre-Modern Period* (Leiden: Brill, 1996), pp. 257–82. On Alḥadeb see also idem, "History and Jewish Scientific Study in Mediaeval Spain," in Lola Ferre, ed., *La ciencia en la España medieval* (Granada: Universidad ICE, 1992), pp. 163–74.

(Judeo-)Arabic texts and finishing his works on prosody, grammar, and lexicography written in (Judeo-)Arabic around 1468. His disciples still read and copied the works ca. 1480.[32] Nor were these individuals marginal to their community. For example, R. Isaac Bar Sheshet was a major authority and leader in the kingdom of Aragon in the second half of the fourteenth century. He writes a letter to the astronomer Judah ben Asher in Castile telling him that Isaac Alḥadeb, Judah's student, had left with him three quires/notebooks (*qundresin*) of Avicenna's commentaries and that he had asked R. Isaac to send them to R. Judah, his teacher. In other words, at the center of the communal leadership in Christian Spain, the models of the society at large, the spiritual, legal, and intellectual leaders recognized by the ruling powers continued to be interested in science and in Arabic culture.

Examination of archival documents similarly shows that, in Castile, *conversos* continued to keep scientific manuscripts in Arabic in their homes even after the expulsion of 1492. In this particular case, the evidence comes from the field of medicine, but it can be argued that the onus of proof has now shifted to those who would maintain that Arabic had been left behind in the wake of the Almohad invasion or around the time of Las Navas de Tolosa. Indeed, attention to archival research and Inquisition files reveals significant evidence on the libraries of *conversos*. One such file contains a testimony before the Inquisition from 1505. It is concerned with a *converso* physician from Almazán, Maestre Bernal, apparently the physician in attendance to the Countess of Monteagudo, and reads as follows: "the medical books which he possessed were written in Arabic script and she – the daughter – had seen him read them. These medical books are now in the possession of this witness's mother."[33]

It must be pointed out the Countess herself was the wife of a scion of that so-called Renaissance dynasty – the House of Mendoza.[34] This, again, is no mere genealogical anecdote, but has repercussions for the history of culture and philosophy in medieval Spain, for the Mendozas were reputed to have a particular type of relations with Jews and *conversos*. It is in those circles that the Romance translation of the *Guide* as well as glosses on it in the Romance of Castile were done.

Again, historians believe that in Portugal, in the 1490s, permission was granted to *converso* physicians to keep their Hebrew manuscripts as necessary tools for the practice of medicine.[35] Thus, although there is reason to engage with history and geography, the relations between Reconquista and language are not simple and direct.

SCHOLARLY DYNASTIES AND THE TRANSMISSION OF BOOKS

The dynastic aspect is significant in different ways – the transmission of interest in science at an early age, engagement of and payments to teachers, and proficiency in languages – but is most relevant as a factor in the transmission of books (which were not always owned by the public). This relevance can be shown by attention to Judah Ibn Tibbon's (1120–90) ethical will. Addressing his son Samuel (ca. 1150–1230), Judah refers to the family library and to his efforts to buy books for Samuel – "I honored thee by multiplying thine books" – so that

[32] Milagros Jiménez Sánchez, ed., *Seadyah Ibn Danan, Sefer ha-Shorashim* (Granada: Universidad, 1996).

[33] C. Carrete Parrondo, *Fontes Iudaeorum Regni Castellae* IV (= *Los judeoconversos de Almazán*) (Salamanca: Universidad Pontificia de Salamanca, 1987), pp. 28–9.

[34] Helen Nader, *The Mendoza Family in the Spanish Renaissance, 1350 to 1550* (New Brunswick, NJ: Rutgers University Press, 1979); idem, *Power and Gender in Renaissance Spain: Eight Women of the Mendoza Family, 1450–1650* (Urbana, IL: University of Illinois Press, 2004); Luis M. Girón Negrón, *Alfonso de la Torre's 'Visión Deleytable': Philosophical Rationalism and the Religious Imagination in Fifteenth-Century Spain* (Leiden: Brill, 2001).

[35] Maria Jose Pimenta Ferro Tavares, *Os judeus em Portugal no seculo XV*, Vol. 1 (Lisbon: Universidade Nova de Lisboa, Faculdade de Ciências Sociais e Humanas, 1982).

Samuel did not have to borrow books from others. Judah also mentions the catalogue of the library and recommends to his son to establish one of his own. He also mentions the teacher whom he, the father, employed for his son.[36]

The idea of amassing a library for one's children is not new, and Judah's will reflects an established tradition. Wisdom poems ascribed to the circle of Hai Gaon (ca. 1000–38) had admonished parents a century earlier to buy books of science for their sons and daughters:

If children and daughters are born to you . . . buy them as many books as you can [so that] you should know arithmetic and understand books of medicine, then you'll know the date of the New Moon and the days of the festivals each year.[37]

The same pattern is evinced in Sefarad, too. Recent studies of twenty-six Jewish library inventories from fifteenth-century Jaca in the kingdom of Aragon show that parental inheritance is explicitly mentioned as a source of ownership. Another random example, from 1337, is the case of Astruch Adret "judeus Cardone," who fulfills his promise to give "Enoch(?) Adret filio meo" at the time of his wedding "novem pecias librorum de ebraych."[38]

In this context of the argument for a dynastic factor in the history of science and philosophy, it may be relevant to recall that Maimonides links the concepts of science and dynasty. In his epistle to Samuel ben Judah Ibn Tibbon (1160–1232), he writes as follows:

I have known for years about the fame . . . of your father . . . and I have been told about him from the mouth of scholars and famous people who are from the city of Granada from the families of Alfacar, and among them the ancient Ibn Matqa, also an important and honorable scholar from the scholars of the city of Toledo, came here and spoke to us about the honor of Rabbi Judah Ibn Tibbon and also Rabbi Meir . . . a disciple of Rabad of Posquières . . . and of Abraham Ibn Ezra. . . . He also told me about [Rabbi Judah Ibn Tibbon] your father. . . . And I did not know he had left a son . . . for "a son is born unto us."[39]

36 I. Abrahams, *Jewish Ethical Wills* (Philadelphia: Jewish Publication Society, 1927), pp. 51–92, on pp. 57, 58, 81: *kibbadtiḵa be-harbot leḵa sefarim;. . . ha-mazkeret šel sefareḵa; we-ʾim hayita kotev sifrei kol bayit min ha-ʾarmarim* (or *ʾarmarius*) *be-ʾiggeret . . .*

37 "*Šir musar*," in A. Harkavy, *Ḥadašim gam yešanim* (Jerusalem: Karmiel, 1970), p. 116; S. Assaf, *Meqorot le-toledot ha-ḥinnuḵ be-yiśraʾel*, ed. S. Glick (New York and Jerusalem: The Theological Seminary of America, 2001), 2: 29–30 (no. 4). The idea that manuscripts were produced not only for the patron but also for the descendants was so widely accepted that it became a formula of the colophon of medieval Hebrew manuscripts.

38 Eleazar Gutwirth and Motis Dolader, "Twenty-Six Jewish Libraries from Fifteenth-Century Spain," *The Library* 18 (1996): 27–53; Gabriel Secall, "La sinagoga de Valls i el seu entorn socio-religios," *Quaderns d'historia tarraconense* 8 (1989): 7–16, on p. 15 n. 45. Another example of transmission of family libraries is that of the Atzarells. On December 10, 1373, Bondio, as son and inheritor of the library of his father, Salomo Samuel Atzarell, asked a notary to draw up an inventory of sixty-eight books belonging to the library of his father, which was situated in "domo studii" or in "dome sive camera prope studium." See A. J. Soberanas i Lleo, "La Biblioteca de Salomo Samuel Atzarell," *Boletín de la Real Sociedad Arqueológica Tarraconense* 67–8 (1967/8): 191–204. This, incidentally, confirms my impression of the rise of the "studio" in late medieval Spain. The library of Judah Benardut of Saragossa (ca. 1439) may also be relevant to the history of science, as it contained "otro libro con taulas blanchas paper scripto ebrayco el qualo es nombrado Almajac [= *Almagest*]. Otro libro con cubierta vert de paper nombrado Antidotari de Nicholau. . . . Otro libro con cubierta vert scripto ebrayco en paper de Avicena Otro libro con cubierta blanca de los nombres de las species." The document – an inventory of the library of Rabi Seneor "vecino de la Almunia de Doña Godina" – was transcribed from the series of the notary D. Agustin, 1439. It may also be relevant to inheritance of scientific works in Hebrew as it was attached, in the archives, to the testament of R. Seneor; that is, a document in Hebrew characters that was not transcribed by M. Serrano y Sanz, *Orígenes de la dominación española en América* (Madrid, 1918), who draws attention to it on p. xlix n. 2. The document, containing the *šeṭar ṣawwaʾah* (will and testament) of *he-ḥaḵam ha-kolel ha-filosof R. Šneʾor* [or *Śeneor*] *ben Meir* is now available in transcriptions as "Testo 17" of L. Minervini, *Testi giudeospagnoli medievali* (Naples: Liguori, 1992), 2: 134ff. It adds little to the data on scientific books in his library, but it may be of interest for reconstructing his circle. Note also the appellation *ha-filosof.*

39 *ʾIggerot ha-Rambam* (Leipzig, 1859), f. 27a.

Thus, in the twelfth century, when travelers from Spain reach Old Cairo, the sage of Fostat's conversations are about families. Maimonides is very interested in and even knowledgeable about the family history of the Tibbonids, Alfacar, and other dynasties of intellectuals working in translations and scientific and philosophical texts. He chooses this part of the conversations for publication in his epistle to Samuel ben Judah Ibn Tibbon. In the fourteenth century, Don Juan Manuel – nephew of Alfonso X – links these concepts again. He composed *El libro de los castigos* in which Juan Manuel – regent of Castile – addresses his son, Don Fernando, and admonishes him: "If you are looking for a physician let him be of the lineage of Don Zag who was my father's physician and my physician too."[40] There is a symmetry here: The tradition for practicing medicine in the Jewish family mirrors the Alfonsine family's choices of physicians. In other words, patronage of science and scientists took this dynastic factor into account.

The linkage between family and scholarship/scientific work is not restricted to panegyrics. It could be part of invective as well. Toward the end of the same century, in 1394/5, a converted astronomer from a famous family of Jewish astronomers from the kingdom of Aragon is addressed as follows: "I ask only this of you: when you come to sign your name do not mention the name of your father; . . . do not dignify yourself by his memory."[41]

The writer is Profayt Duran, and the text is the *ʾIggeret ʾal tehi ka-ʾavoteḵa*; the addressee is the last of the famous dynasty that produced Yom Ṭov Poel and Bonet Bonjorn. The dynasty is closely connected to compositions on astronomy of fourteenth-century Aragon as shown by studies of iconography, translations, and personalities engaged in science in this particular period and region (i.e., northern Spain in the second half of the fourteenth century and early fifteenth century), such as Bonjorn and Duran.[42]

The family, then, is a factor in the transmission of knowledge and is so linked in the medieval evidence. It is also a factor in determining attitudes toward the legitimacy and justifications of scientific study in small scientific circles.[43] Similarly, the transmission of professional knowledge and expertise is bound up with attitudes toward languages/cultures. For example, the Israeli family has recently been shown to have been linked for many generations, from the eleventh up to the fourteenth century, to the notarial world of land deeds.[44] This professional world also implied constant contact with Arabic, Hebrew, and Romance texts, so that proficiency in languages was the first fundamental requirement of professional life. This kind of professional life is in turn linked to a specific urban and demographic context; namely, that of Jews who own real estate in relatively densely populated *juderias* in which there is a need for the establishment and preservation of title deeds. Notarial

[40] See the critical edition of *El libro de los castigos* in Reinaldo Ayerbe-Chaux, ed., Juan Manuel, *Cinco Tratados* (Madison: University of Wisconsin Press, 1989), pp. 122–3.

[41] *ʾIggeret ʾal tehi ka-ʾavoteḵa*, in F. Talmage, ed., *The Polemical Writings of Profiat Duran* (Jerusalem: Merkaz Z. Shazar and Merkaz Dinur, 1981), p. 83 (Heb.).

[42] A. García Aviles, "Arte y astrología en Salamanca a finales del s xv," *Anuario del Departamento de Historia y Teoría del Arte* 6 (1994): 39–60. Since Millás, more attention has been devoted to some of the translations of the originally Hebrew works of the family. See especially J. Chabás, A. Roca, and X. Rodríguez, "Sobre las tablas astronómicas de Jacob Ben David Bonjorn (1361)," *Estudios sobre Historia de la Ciencia y de la Técnica. IV Congreso de la Sociedad Española de Historia de las Ciencias y de las Técnicas* (Valladolid: Sociedad Española de Historia de las Ciencias y de las Técnicas, 1988), pp. 1023–8; José Chabás i Bergon, "Astronomical Tables of Jacob ben David Bonjorn," *Archive for History of Exact Science* 42 (1991): 274–314.

[43] For these circles and their views on family and the legitimation of scientific study see, for example, Eleazar Gutwirth, "From Jewish to 'Converso': Humour in Fifteenth-Century Spain," *Bulletin of Hispanic Studies* 67 (1990): 223–33; idem, "History and Jewish Scientific Study in Late Mediaeval Spain"; idem, "Religion and Social Criticism in Late Medieval Roussillon. An Aspect of Profyat Duran's Activities," *Michael* 12 (1991): 135–56 (Heb.)

[44] Gutwirth, "Toledo, circa 1320."

offices of such prominence as in Toledo thus served as constant spaces of mediations between languages and religions; they were naturally rarer in the rural *juderias*. These notarial offices are therefore important for the history of science inasmuch as they were a space of linguistic porosity in medieval Spain.

CONVERSOS

One of the historical aspects of Spanish Christian medieval science, identified by Beaujouan on the basis of his studies of Latin-character manuscripts in Christian libraries, is that it was not a mainly university-conditioned science.[45] It was also a science for which the episcopal and monastic patronage or context was important. It is in this context that there occurs what he calls "la précoce maturité des langues vernaculaires" in the sciences in Christian Spain, as well as the "rôle considérable des Juifs," including *conversos*. They indeed were one of the channels for interaction between Hebrew and Romance scientific texts and ideas.

The *Sevillana medicina* of ca. 1380 is an innovative work on medical topography in the West written in the vernacular. It is relevant here because it was composed by an individual of Jewish origins, who studied under Jewish masters at Avignon, wrote scientific work and poetry in Hebrew, and subsequently converted and composed works in the vernacular. Beaujouan views him as paradigmatic: Moses ben Samuel of Rocamaura, author of a Hebrew translation of Gordon's *Lilium,* converts to Christianity and produces the *Sevillana medicina* under the patronage of Pedro Gomez Barroso, bishop of Seville since 1379. This instance confirms the pattern of a Castilian medicine that is not university led but urban and that is produced in situations of episcopal patronage where there is significant contact with Jews or Hebrew texts. Recently Amasuno has argued that the convert physician was also involved in anti-Jewish polemics, but it is questionable whether this disturbs the wider picture and that of Moses' intellectual roots in Hebrew scientific texts.[46] Still, one may ask whether the *Sevillana medicina* is representative (that it was published in 1885 in a beautiful edition by the Sociedad de Bibliófilos andaluces and thus became one of the accessible texts of vernacular medicine should not bias our perception).[47] That this probably is the case is shown by another scientific text, the fifteenth-century Castilian Romance version of Isaac Israeli's *Treatise on Fevers*. Llamas's edition of this text has been criticized more than once, but his thesis that it is the work of a Jewish translator does persist and has been reaffirmed recently. Romano's survey of Jewish translations in medieval Spain similarly accepts its Jewish background.[48]

Chirino is a third case in point. He was court physician to Juan II in the first half of the fifteenth century, and his *Menor daño de la medicina* has long been seen as a prominent example of medical texts in the vernacular in fifteenth-century Spain. Special notice has been taken of his critique of the ethics of medical practitioners and also of his idea that keeping one's health is a moral or religious obligation. Recent textual research on fifteenth-century Castilian Romance texts has made it possible to reconfirm Chirino's Jewish origins and

[45] Guy Beaujouan, *Science médiévale d'Espagne et d'alentour* (Aldershot: Ashgate, 1992), p. x. See also T. F. Glick, "Moriscos y marranos como agentes de la difusión tecnológica," *Arbor: Ciencia, Pensamiento y Cultura* 149 (1994): 113–31.

[46] M. V. Amasuno, "The Converso Physicians in the Anti-Jewish Controversy in Fourteenth- and Fifteenth-Century Castile," in S. Kottek, ed., *Medicine and Medical Ethics* (Jerusalem: Magnes, 1994), pp. 92–118.

[47] Juan de Aviñon, *Sevillana medicina* (Seville, 1885). See also idem, *Sevillana medicina*, ed. José Mondéjar (Madrid: Arco, 2000).

[48] For these and other studies see Eleazar Gutwirth, "Language and Medicine in the Early Modern Ottoman Empire," in Jürgen Helm and Annette Winkelmann, eds., *Religious Confessions and the Sciences in the Sixteenth Century* (Leiden: Brill, 2001), pp. 79–95. See also Esther Boucher, "Contribución al estudio paleográfico y lingüístico del Tratado de las Fiebres de Ishaq Israeli," Ph.D. dissertation, Université Laval, Montreal, 1995.

education.[49] More important, it has also shown that he was perceived by his contemporaries in terms of his early Jewish phase and that he was in demand by patrons of scientific work because of this image and perception: Contemporaries perceived a link between being of Jewish origins and being sought after as a physician.

A fourth case of fifteenth-century linkage between *conversos* and Hebrew scientific works/books is provided by one of the manuscripts of the Hebrew translations from Arabic of Maimonides' *Treatise on Asthma.* A reexamination of the Munich manuscript led to the conclusion that Steinschneider had "emended" (or – much less likely – misread) the colophon, thus obscuring the context and patronage of the scientific work: It was a medical work, in Hebrew, carried out for a notable *converso* – *El relator* Fernán Díaz de Toledo – by a fifteenth-century Hispano-Jewish translator, Joshua Xatibi.[50]

ALJAMIADO TEXTS

We now turn to the history of reading and to a textual phenomenon: the circulation and dissemination of scientific works in the vernacular, particularly in the field of texts of science circulating in Judeo-Spanish aljamia. Although Romance terms entered Hebrew scientific literature earlier and Jews were employing the vernacular in scientific works earlier, the aljamiado phenomenon becomes more visible from the fifteenth century onward. In recent decades it has been realized that the corpus of aljamiado manuscripts on scientific subjects is larger than imagined in the older histories of science. For example, examination of one manuscript revealed that is an aljamiado transcription into Hebrew characters of three different works, in precise editions, by Luis Llobera de Avila, physician to the Habsburg Emperor Charles V.[51]

One of the ways to carry forward the research, in addition to continuing to search for such manuscripts and to identify them, is related to codicology. The question could be formulated thus: Does the treatment of scientific texts by the medieval scribes change according to whether the scientific work is in Hebrew or in aljamia? The preliminary impressions offered by observing the manuscripts is that the codicological features of the aljamiado manuscripts show little difference from those in Hebrew. This means that the Jewish scribes of texts in Hebrew letters made no sharp hierarchical differentiations between these and other (Judeo-Arabic, Hebrew) texts. It is hoped that future research may confirm or refute the initial impression, which is that the similarities occur in concrete features of the *mise en page* (ruling, justification, consistent number of lines, catchwords) and the ornamentation. In one case, the ornamentations of an aljamiado manuscript were sufficiently noteworthy to be selected for inclusion – although without identification – in Narkiss's study of Spanish and Portuguese Hebrew manuscripts in the British Isles.[52]

SOCIALIZATION: THE DISSEMINATION OF SCIENTIFIC IDEAS THROUGH HOMILIES

Let us now look at the homiletic genre as a vehicle for the socialization of scientific knowledge. I speak of socialization because the institutional frameworks of university-led production of knowledge are largely irrelevant here. Consider Isaac Caro's *Toledot Yiṣḥaq,* which we can readily define as a homiletic work based on an originally oral public delivery: "They all

49 See on this subject Pedro M. Cátedra, *Exégesis Ciencia Literatura* (Madrid: Crotalon, 1985); Marcelino V. Amasuno, *Alfonso Chirino, un médico de monarcas castellanos* (Valladolid: Junta de Castilla y León, 1993); *Alonso de Chirino, Menor daño de la medicina* (Salamanca: Universidad de Salamanca, Acta Salmanticensia, 1973).

50 E. Gutwirth, "Fernán Díaz de Toledo y los Judíos," *Sefarad* 46 (1986): 229–34.

51 E. Gutwirth, "The Hispanicity of Sephardi Jewry: A Genizah Study," *Revue des études juives* 145 (1986): 347–57.

52 Bezalel Narkiss, *Hebrew Illuminated Manuscripts in the British Isles* (London: British Academy, 1982), last plate.

flocked there together to listen" (*we-ne'esfu šamah kol ha-ʿadarim lišmoaʿ*), the author reports. This book is also related to Caro's Toledan phase of the 1480s. Caro describes himself as "Isaac ben Joseph Caro the Spaniard from the renowned town of Toledo in Castile" (*Yiṣḥaq ben-Yosef Caro ha-Sefaradi me-ʿir ṭoliṭola be-qasṭilia rabbati ha-mehullalah*).[53] But how is this book of sermons related to the history of science among the Jews of fifteenth-century Iberia?

With respect to the weekly portion of *Naśoʾ*, the author raises the ancient, traditional question: *lamah nismeḵah parašat nazir le-parašat soṭah* (Why does the Bible [Num. 5:11–6:21] discuss the rules of the adulterous wife in immediate contiguity to those of Nazirites)? Isaac Caro reviews the traditional answers and offers a new one: Both topics are related, because both are concerned with the power of the imagination. This leads him to discuss among other things a proof of this assertion; namely, the field of diagnosis and treatment of (what in medieval Europe was known as) the lovers' malady of eros or the malady of heroic love. Galen and his forerunners had treated this theme, and it was developed by such famous authors as Arnau de Vilanova, who devoted all of his first medical work, *De amore heroico*, written in the mid-1280s, to eros.[54] However, it was Avicenna who had introduced the *vetula* (the old woman) as remedy. Isaac Caro's description of the *vetula* as "a woman, old, ugly, and shameless as an animal" is particularly resonant in the area of Toledo, where both he and Fernando de Rojas were working: Both the Jewish author and the *converso* author of the masterpiece known as *La Celestina* (1499) – perhaps the first European novel – were inspired by the concept of the *vetula*. Both saw science as a subject for creative development in areas of their mainstream cultures. Needless to say, they were both active in the area of Toledo and they were contemporaries.

When confronted with the verse, "Rebekah the daughter of Bethuel the Syrian of Padan Aram the sister of Laban the Syrian" (Gen. 25:20), Caro, again following old models, asks the traditional question: Why so much detail? His reply is related to the notion that the airs and waters have an influence on humans; he adds in the case of the waters of Vera de Plasencia or Buitrago (and not Buitrano as in a Jerusalem printing). This answer is based on classic Hippocratic and Galenic notions about airs and waters,[55] although the examples are drawn from the concrete cultural or geographic references that would be understood by both preacher and public ("the water is bad or the air" [*ha-mayim raʿim ʾo ha-ʾawir*], as he writes). Thus, the homily is, among other things, a vehicle for the (at least) twice-weekly dissemination of scientific ideas and texts among a general public. It is within these communities and for these communities that scientific texts in Hebrew were produced.

Contemporaries perceived the relevance of such fifteenth-century Hispano-Jewish sermons to philosophy. Writing to his son, Ḥayyim Ibn Musa explicitly refers to the "preachers . . . who rise to the podium before the reading of the Torah to preach. And most of their sermons are about syllogisms and philosophical matters. And they make explicit mention of Aristotle, Alexander (of Aphrodisias), Themistius, Plato and Averroes and Ptolemy."[56]

[53] For background, references, and further explanations, see Eleazar Gutwirth, "La España de Isaac Caro," in C. Carrete Parrondo, ed., *Actas del IV Congreso Internacional "Encuentro de las Tres Culturas"* (Toledo: Ayuntamiento, 1988), pp. 51–6; Eleazar Gutwirth, "Isaac Caro in His Time," *Miscelánea de Estudios Arabes y Hebraicos* 40 (1991): 119–30.

[54] Arnaldi de Villanova, *Opera medica omnia*, Vol. III, ed. Michael R. McVaugh (Barcelona: Universitat de Barcelona, 1985).

[55] Thanks to Wasserstein we have an edition that confirms the Hebrew textual availability of such notions in the late Middle Ages. See *Galen's Commentary on the Hippocratic Treatise, Airs, Waters, Places, in the Hebrew Translation of Solomon Ha-Meʾati*, ed. Abraham Wasserstein (Jerusalem, 1982) (= *Proceedings of the Israel Academy of Sciences and Humanities*, Vol. 6, No. 3).

[56] D. Kaufmann, "ʾIggeret Ḥayyim Ibn Musa li-vno R. Judah," *Bet ha-Talmud* 2 (1882): 110–25, on p. 118.

The more significant question here is in what language these homilies were delivered: the texts that have come down to us are in Hebrew, but do they reflect a historical situation of the sermons, as they were originally delivered before an audience on the Sabbath when no writing is permitted? Or were the sermons later rewritten? Were they delivered originally in the vernacular and then reelaborated in Hebrew?[57] Evidence is offered by Ibn Musa's Epistle itself. Of course, it is written in the elevated style of that period's Hebrew epistolography, but when the author arrives at a crucial point – when he wishes to describe with some precision the exact degree of irreverence in a preacher's Sabbath sermon that he is discussing (probably held in Salamanca around the middle of the century) – he switches codes pragmatically and he cites verbatim, namely in the vernacular: "las mis cosas baldias."

The socialization of philosophical, scientific knowledge through the sermon, then, was conducted in the vernacular: This is further corroborated by evidence from archival documents, so we no longer have to rely on speculation. Surviving archival documents concern the case of Segovia. On the eve of the expulsion, the brother of the chief rabbi, Solomon Senneor, was preaching at a local synagogue. Attention to Inquisition files can result in a closer familiarity with the sermons, their dates, the place of their delivery, the precise public, the content, and also the language of the sermons. Thus, for example, medieval Hebrew sermons rarely have precise dates. In this case, however, a testimony about a sermon is precisely dated. An Inquisition witness asserts on April 21, 1486, that the sermons of Solomon Senneor were about natural philosophy and that the public for the sermons was not only Jewish: "He saw among those who assisted at a sermon pronounced by Don Solomon his brother in the chief synagogue of this city some Christians . . . Anton Basquez the canon, another one . . . [was] the licenciate physician . . . [another one was] Alonso Albarez the canon. . . . The sermon concerned natural and moral philosophy."[58]

Thus, the documented public – rather than a hypothetical public – included Christians, who, at this date could follow such a sermon only if delivered in the vernacular. We now understand that the identification of the public helps explain the author's directions. Clearly, the sermon was an occasion for developing and socializing knowledge about natural philosophy in the vernacular. Such evidence on the vernacular as the medium of sermons containing science may be found after examining other archival records as well. For the question of the relations between language and science in medieval Spain, this finding appears to be of some interest.

CONCLUSION

In the nineteenth century, the construction of national imaginaries involved the privileging of certain questions of origins, precedence, and influence, which included within their scope views of languages. From the perspective of the monoglot's ideology, languages appear in hierarchical or conflictive situations, rather than in contact. This leads to thinking about the rise of one language as dependent on the decline of another. The corpus of recent research briefly surveyed here has taken a different direction: The reconstruction of intellectual production in medieval Spain depends on attention to more than one language or culture.

[57] This question was raised already ca. 1832 by Zunz in his *Gottesdienstliche Vorträge*. His answers do not directly bear on the Iberian peninsula in the period considered here. Zunz was aware of printed evidence from seventeenth-century Amsterdam, for example, but was not particularly familiar with evidence in or on the medieval Ibero-romance vernaculars. See L. Zunz, *Die gottesdienstlichen Vorträge der Juden, historisch entwickelt: Ein Beitrag zur Alterthumskunde und biblischen Kritik, zur Literatur- und Religionsgeschichte* (Berlin, 1832).

[58] Carlos Carrete Parrondo, ed., *Fontes Iudaeorum Regni Castellae* III (Salamanca: Universidad Pontificia de Salamanca, Universidad de Granada, 1986), No. 190.

Alongside the survival of Arabic and the creativity in Hebrew, there was the spectacular rise of the living language, the Romance, as a vehicle of science. It was not a passing curiosity during the reign of – and in the Jewish circles close to – that *stupor mundi,* Alfonso the Wise. Rather, it was a long-lasting, profound phenomenon and it led to a deep-rooted tradition. As has been seen here, this tradition survived not only in the obvious case of Alfonsine works preserved in post-Alfonsine aljamiado manuscripts. It survived also in sermons and in other (non-Alfonsine) scientific works laboriously copied and preserved in the Romance in, for example, aljamiado manuscripts from the late Middle Ages and the early modern period. Research has attended also to the sources of the interest in the sciences among medieval Iberian Jews. Rather than due to spontaneous generation, their philosophical and scientific activities depended on complex infrastructures. Their reconstruction and study require attention to historical specificities, even to professional, family, and library histories and the consequent problems of circulation and access to scientific and philosophical knowledge.

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