The Scholastic Aristotelian Background

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Contents

The philosophical doctrines to which the moderns were primarily reacting were those of the 'School' philosophies as advocated by teachers or "scholastics" at the major univerisities of the medieval era (Oxford, Cambridge, Paris, Bologna, Salamanca). These centers of learning trained for the main professions (medicine, law, and theology) and "natural philosophy" via a "liberal arts" curriculum of grammer, rhetoric, and logic, (called the "trivium") and mathematics, geometry, astronomy, and music (called the "quadrivium"). "Scholastic philosophy", in this broad sense, thus constituted the primary set of philosophical doctrines in the medieval period.

Scholastic philosophy cannot be easily characterized. Philosophers from the scholastic period occupied an astonishing array of positions regarding a variety of issues in epistemology, logic, philosophy of language, philosophy of mind, and metaphysics. However, there were several general doctrines or methods of inquiry that were broadly shared by the scholastics, and were gradually modified, questioned, and ultimately rejected, by modern philosophical theory. These doctrines or methods often have roots in the philosophy of Aristotle, whose influence in Medieval philosophy was so pervasive that he was commonly referred to simply as "the Philosopher", and the standard manner for writing philosophical works was to present them as commentaries on Aristotle's writings.

The period of scholastic philosophy which would have had the greatest influence on the Modern period roughly follows that of the period from Augustine (354–430), and the synthesis of Christian and classical Greek—especially neoplatonist—philosophy, to Aquinas

(1225–1274), who combined Catholic doctrine with Aristotelian metaphysics in original and influential ways. Subsequent to Aquinas's death, scholastic doctrine would develop considerably, see criticism from both within and without, and ultimately face a radical and precipitous decline in influence, only to have its fortunes briefly revived in the sixteenth and seventeenth centuries in the work of figures like Francisco Suárez (1548–1617).

Below I discuss five central ways in which Scholastic, and ultimately early modern, philosophy was influenced by Aristotle. These are his empiricism, his "hylomorphism", his conception of causation and explanation, his view of science, and his cosmology.[1]

1 Aristotelian Empiricism

One of the central doctrines of Aristotelianism is a form of what we now call 'empiricism.' Represented in the scholastic era via the motto '*nihil est in intellectu quod prius non fuit in sensu*' (there is nothing in the intellect that was not first in the senses), this doctrine holds that the origin of all thinkable content must be traced to our sensory interaction with the world. There is nothing of which we can think that is not first given, in some form or another, through the senses. This entails that all knowledge must ultimately be grounded in (i.e. depend on) sensory experience. This in turn require two things. First, reality, if we are to know it in the way demanded by proper science (more on this below), must be accessible to the senses. Second, our sensory faculties (vision, touch, smell, etc.) must be reliable in bringing us into cognitive contact with reality. If our sensory apprehension of reality systematically distorts its character, or otherwise causes us to have false beliefs concerning reality, then we cannot rely on the senses in the acquisition of knowledge. The trio of questions concerning whether the content of our concepts must come from experience, whether knowledge depends on our having experience, and whether the senses are a reliable means of apprehending reality, would be central to the philosophical systems of modern thinkers such as Descartes, Locke, Leibniz, Hume and Kant.

2 The Four Causes

Aristotle believed that in order to be properly said to "know" something one must understand why it is the case. In connection with this conception of knowledge in terms of an

[1] It's important to note that many scholastics reject one or more of these Aristotelian doctrines, and many endorsed them in ways that allow for only very general agreement with what Aristotle plausibly held. Nevertheless, the doctrines discussed below form a backdrop against which many modern philosophical views develop.

understanding of the "why" of things, Aristotle argues that we must know how a thing is caused to be (APost. 71 b 9–11; see also APost. 94 a 20). In service of this he articulates an explanatory scheme involving four distinct notions of "cause" (*Aitia* [Greek: αἰτία]). He puts it this way in his *Physics*:

> One way in which cause is spoken of is that out of which a thing comes to be and which persists, e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species.
> In another way cause is spoken of as the form or the pattern, i.e. what is mentioned in the account (*logos*) belonging to the essence and its genera, e.g. the cause of an octave is a ratio of 2:1, or number more generally, as well as the parts mentioned in the account (*logos*).
> Further, the primary source of the change and rest is spoken of as a cause, e.g. the man who deliberated is a cause, the father is the cause of the child, and generally the maker is the cause of what is made and what brings about change is a cause of what is changed.
> Further, the end (*telos*) is spoken of as a cause. This is that for the sake of which (*hou heneka*) a thing is done, e.g. health is the cause of walking about. 'Why is he walking about?' We say: 'To be healthy'— and, having said that, we think we have indicated the cause. (Phys. 194b23–35)

This results in four distinct kinds of explanation, which answer four questions—viz., *what is it?* (formal), *what is it made of?* (material), *what brought it about?* (efficient), and *what is it for?* (final). We can categorize these as follows:

1. The **material cause**: that from which something is generated and out of which it is made, e.g. the bronze of a statue.
2. The **formal cause**: the structure which the matter realizes and in terms of which it comes to be something determinate, e.g., the shape of the president, in virtue of which this quantity of bronze is said to be a statue of a president.
3. The **efficient cause**: the agent primarily responsible for a quantity of matter's coming to be informed, e.g. the sculptor (or the sculptor's knowledge of art) who shaped the quantity of bronze into its current shape, the shape of the president.
4. The **final cause**: the purpose or goal of the compound of form and matter, e.g. the statue was created for the purpose of honoring the president.

According to Aristotle, citation of at least some of the four causes is both *necessary* and *sufficient* for providing an adequate explanation. As Chris Shields points out, since not all four

causes are present in every instance to be explained, it cannot be that *all four* are necessary for an adequate explanation.

> for example, coincidences lack final causes, since they do not occur for the sake of anything; that is, after all, what makes them coincidences. If a debtor is on his way to the market to buy milk and she runs into her creditor, who is on his way to the same market to buy bread, then she may agree to pay the money owed immediately. Although resulting in a wanted outcome, their meeting was not for the sake of settling the debt; nor indeed was it for the sake of anything at all. It was a simple co-incidence. Hence, it lacks a final cause. (Shields 2015)

One of the central disputes in the modern era concerns whether appeal to anything more than material and efficient causal explanations are needed in an adequate science of nature. A characteristic position taken by Descartes, Locke, Spinoza, and others was to deny that formal or final causes were explantorily necessary or useful. In the case of formal causes, many became suspicious of Aristotle's hylopmorphism, and thus his notion of a "form" as opposed to its "matter". With respect to final causes, many in the modern era argued that there are no final causes other than those explicitly dependent on the will of human beings (this latter position is especially clear in Spinoza and, in slightly weaker form, Kant).

3 Hylomorphism

Aristotle's "hylomorphism" is another central part of his philosophy, and one of the most influential parts of his overall doctrine. Its basic conceptual vocabulary is retained not only in the medieval period, but also well into the modern period. "Hylomorphism" is a compound word composed of the Greek terms for matter (*hulê*) and form or shape (*morphê*). While the Greek term has been retained to describe Aristotle's view (and other views like it), we could also simply refer to the doctrine in English as "matter-formism."

The doctrine of matter and form, which is the basis of hylomorphism, is perhaps best illustrated by examples. Consider two types of change. First, there is *generative* change, as in the building of a house where none existed before, or the conception of a child. Second, there is *qualitative* change, wherein something which already exists is altered, as when a piece of fruit changes color, or a person gets older. Aristotle endorsed a principle, popular in both his time and in the modern era (and in contemporary physics as well) that nothing can come from nothing. So he needed to explain both generative and qualitative change in a way that didn't violate this principle. This meant explaining change in terms of (i) something under-

lying and persisting; and (ii) something gained or lost.[2] These two explanations of change correspond to Aristotle's notions of *matter* and *form* respectively. Matter is what persists through all change, like the bricks of a house, which can persist independently of whether or not the house itself does. And form is what may be gained or lost, either in alteration (losing the form *young* and gaining the form *old*) or in generation (losing the form *lump* and gaining the form *statue*).

The notions of matter and form are paired with two other notions, that of potentiality and actuality. Matter is something that potentially has some feature F, as a lump of bronze may potentially take the shape of a statue. Form is that which makes some bit of matter, which is potentially F, *actually* F (literally, in the case of the statue, less literally in the case of, e.g., a human being).[3]

The basic unit of explanation for Aristotle is called a *substance*. Substances, for Aristotle as well as many of the Scholastics who followed him, possess a particular way of being or existing. Substances exist in themselves, and not in any other thing. Substances thus **substand**, and they also **subsist**, or exist independently of other things. Because of these two features, substances are loci of explanation. Properties inhere **in** (have their being in) the substances which posses them, but not the other way around.

Non-substantial beings, such as properties or events, might stand in as subjects, and thus as loci of explanation, in limited cases. For example, one might say of a fight that it is vicious, or of a rainbow that it is beautiful. Similarly, one might hope of justice that it is blind. But the fight and the rainbow are adjectival on the beings which constitute them (respectively, the fighters and the raindrops), while talk of the blindness of justice, if we are to avoid reifying the property, is purely metaphorical. But these relative substances are not ultimately explanatorily primary because their being, and thus the explanation of their features, depends ultimately on the substances that constitute them.

The conception of a substance as a kind of fundamental being connects with the issue of hylomorphism and change in the following way. Since all the substances in nature, including human beings, exhibit change, all substances are complexes of matter and form. The form possessed by some parcel of matter determines it as the kind of thing that it is, e.g. determines a bit of matter as *gold* or as *living*. Moreover, the kind of form possessed by a particular substance that makes it the kind of thing that it is thereby constrains the sorts of properties that can inhere in the substance. Thus, according to the Aristotelian picture, the

[2] See (Shields 2007, chap. 2) for helpful discussion.

[3] See Shields' discussion and the related SEP entry on Aristotle's theory of causation, for further explanation and references.

changing patterns of properties that we find instantiated in nature are due to various kinds of form/matter complexes, the most fundamental of which are substances, whose way of existing insures that they are the fundamental loci of explanation. Substances, their features, and their behavior, are therefore the subject matter of any "proper" science, so we should look now at the structure of Aristotelian science.

4 Demonstrative Science

We've seen that the Aristotelian worldview conceives of knowledge as ultimately dependent on the senses, and as presenting a world structured in terms of form and matter. Proper knowledge of the world also requires understanding it in terms of a four-part explanatory causal framework. These doctrines are the backdrop to the Aristotelian conception of a science of the natural world—what we now think of as "science" proper. However, our contemporary notion of scientific knowledge, and "scientists" as the people who practice science, only came into existence in the 19th century. Before then, and going back to Aristotle's natural philosophy, the dominant conception of theoretical knowledge, known in Latin as *'Scientia'* (in Greek as *'Epistêmê'* (ἐπιστήμη)), concerned any body of knowledge organized according to some principle or set of principles that exemplify the explanatory relations of what is best known and explanatorily basic as the basis of what is least known and explanatorily derivative (see also (Jardine 1988; Randall 1961; De Jong and Betti 2010)). A 'science' was thus distinguished from a mere aggregate of known facts in virtue of the presence of such explanatory connections between facts.

For example, when asked why trees lose their leaves in the fall, one might reply, "because the wind blows them off." One might even label trees which feature this characteristic as 'deciduous'. Neither the label, in and of itself, nor the description would be a particularity deep or fruitful form of explanation. A better one would be one that articulated *why* there is this connection between season and plant behavior. For example, that diminished sunlight in the autumn inhibits the production of chlorophyll, which is required for photosynthesis, and without photosynthesis trees go dormant and shed their leaves. Now the "deciduous" label has a more explanatory role. We can deduce, from the fact that a tree is deciduous, that it has certain characteristics, and that these characteristics play an important explanatory role in understanding the tree's behavior. Not only that, but the explanation is also importantly *asymmetrical* in nature. A tree is deciduous in virtue of its failure to produce chlorophyll at particular times, and in turn, this lack of chlorophyll production explains why the tree fails to photosynthesize, rather than the other way around.

Aristotle puts the notion of scientific explanation—knowledge why rather than mere knowledge that—this way:

> We suppose ourselves to possess unqualified scientific knowledge of a thing, as opposed to knowing it in the accidental way in which the sophist knows, when we think that we know the cause on which the fact depends, as the cause of that fact and of no other, and, further, that the fact could not be other than it is….The proper object of unqualified scientific knowledge is something which cannot be other than it is. (Aristotle, Posterior Analytics, I.2)

Note that Aristotle believed that scientific explanation not only captures asymmetrical explanatory relations but also ones which are, in some sense, *necessary*. One way in which this explanatory relationship might be modeled is via syllogism. A syllogism is an argument in which a judgment—the "conclusion"—logically follows from some other set of judgments—the "premises" or "assumptions". In Aristotle's logic (and in the logic used from the Medieval and into the Early Modern era) the premises were typically understood to be judgments of what was already known. So a conclusion C follows from some premises A and B, if and only if it is impossible for C to be false while A and B are true (and known). Hence, Aristotle takes proper scientific explanation to be structured in the manner of a logical derivation, where, from basic knowledge, one derives other knowledge via logical argument. As Chris Shields puts it,

> the currency of science is demonstration ([from the Greek] "*apodeixis*"), where a demonstration is a deduction with premises revealing the causal structures of the world, set forth so as to capture what is necessary and to reveal what is better known and more intelligible by nature (APo 71b33–72a5, Phys. 184a16–23, EN 1095b2–4).

Hence, the structure of scientific knowledge is *demonstrative* and its demonstrations exhibit asymmetric explanatory relations between the things known. The demonstrative structure of scientific knowledge raises the problem of how such demonstrations get started. How do we know the premises of a demonstrative argument? As Aristotle puts it,

> Some people think that since knowledge obtained via demonstration requires the knowledge of primary things, there is no knowledge. Others think that there is knowledge and that all knowledge is demonstrable. Neither of these views is either true or necessary. The first group, those suppos-

> ing that there is no knowledge at all, contend that we are confronted with an infinite regress. They contend that we cannot know posterior things because of prior things if none of the prior things is primary. Here what they contend is correct: it is indeed impossible to traverse an infinite series. Yet, they maintain, if the regress comes to a halt, and there are first principles, they will be unknowable, since surely there will be no demonstration of first principles—given, as they maintain, that only what is demonstrated can be known. But if it is not possible to know the primary things, then neither can we know without qualification or in any proper way the things derived from them. Rather, we can know them instead only on the basis of a hypothesis, to wit, *if* the primary things obtain, then so too do the things derived from them. The other group agrees that knowledge results only from demonstration, but believes that nothing stands in the way of demonstration, since they admit circular and reciprocal demonstration as possible. (*APo*. 72b5–21)

Aristotle presents here a dispute between, on the one hand, those who deny that there is any knowledge, because knowledge depends on demonstration, and there is an infinite regress of demonstrated knowledge that we cannot complete. On the other hand there are those that allow for the possibility of non-demonstrative knowledge, but deny that we can have such knowledge. Aristotle, in contrast to these two positions, contends that if all scientific knowledge is derived from things already known there has to be at least some knowledge that is basic and non-demonstrative. Otherwise our claims to justification would run in a circle and nothing would be known.

> We contend that not all knowledge is demonstrative: knowledge of the immediate premises is indemonstrable. Indeed, the necessity here is apparent; for if it is necessary to know the prior things, that is, those things from which the demonstration is derived, and if eventually the regress comes to a standstill, it is necessary that these immediate premises be indemonstrable. (APo. 72b21–23)

Specifically, as we've seen above, Aristotle believed that we reliably gained knowledge of the world via the senses, which then allowed for the subsumption of particulars known via the senses under universals (categories, kinds, attributes), which itself allowed for propositional knowledge of the kind found in syllogistic argument. We'll discuss some of these points below.

The epistemological question of whether science is demonstrative, and whether there is non-demonstrative knowledge of first principles, becomes a major issue in the 17th and 18th centuries. We'll see this especially in our study of Descartes and Locke. Central exemplars of demonstrative science in the early modern period include geometry and basic number theory. Given this basis a major question in the 17th and 18th centuries concerned whether there was a demonstrative science of nature (physics) and whether there was a demonstrative science of morality. Attempts to answer these questions by various philosophers in the early modern period will occupy us throughout the semester.

5 Cosmology

So far we've seen that, for Aristotle and the medieval philosophers influenced by him, the world is construed as consisting of combinations of form and matter, proper scientific knowledge of which requires an investigation of the cause(s) of a thing, and is articulated in terms of demonstrative syllogisms whose fundamental premises are known, at least ultimately, in a non-demonstrative manner. Non-demonstrative knowledge is gained, as least partly, by our sensory experience of the natural world. This conception of scientific knowledge resulted in a particular theory of the structure of the universe (*kosmos*) and our place in it and was heavily influenced by christian doctrine. It was relatively stable until near the end of the Renaissance, when Copernicus, Galileo, Kepler, and others argued that the Earth and other planets and stars moved through space, and via imperfect (i.e. elliptical) orbits (Kuhn 1957).

Before Copernicus, the dominant geocentric model was that articulated by Claudius Ptolemy, in which the entire universe rotated on a series of fixed 'celestial spheres' in which were embedded all the stars and planets. The various 'spheres' operated according to different laws. For example, material decay was a feature only of matter in the 'sublunary' sphere (i.e. in proximity to the Earth). The material (the aether) which constituted the rest of the 'superlunary' world (i.e. the world beyond the moon) was incorruptible. This idea that there were different laws for different parts of the cosmos would be radically challenged by Descartes, Newton, and Kant.

There were considered to be four fundamental qualities of things (related to Empedocles's four elements), viz., *hot*, *cold*, *wet*, and *dry*. The combination of these qualities gives rise to (and thus explain) the four elements (earth [cold, dry], air [hot, wet], water [cold, wet], and fire [hot, dry]) and to all the other sensible qualities of things (e.g. texture, color, odor, taste, etc.). Aristotle thus considered hot, cold, wet, and dry the *primary qualities* of things (i.e. substances). Other qualities, such as texture are derivative of this primary qualities, and for that reason classified as *secondary* qualities. Robert Boyle and John Locke would go on

to radically revise this model of explanation (see Locke's *Essay*, II.8). They would retain a primary/secondary distinction but revise the membership of these categories.

Virtually every aspect of the medieval Aristotelian theory of the universe or cosmos would be revised in some manner duering the early modern period. Copernicus's displacement of the geocentric model of the cosmos with a heliocentric one is just one of the earliest and clearest examples. And it is partly due to the displacement of the standard view of the cosmos, heavily influenced as it was by Judeo-Christian doctrine, that historians would come to mark this era as the beginning of the 'scientific revolution.'

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