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How (not) to study Descartes' Regulae

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ARTICLE

HOW (NOT) TO STUDY DESCARTES' *REGULAE*

Bret J. Lalumia Doyle

Only one who has really thought through this relentlessly sober volume long enough, down to its remotest and coldest corner, fulfills the prerequisite for getting an inkling of what is going on in modern science.¹

Martin Heidegger

INTRODUCTION

This essay is part of a larger project. I would like to argue that, by 1628, Descartes had formulated a coherent, hypothetical and non-metaphysical vision of natural science, and that he had achieved, in accord with this vision, many of the results he later published in his *Discourse on the Method* (1637). I would argue further that he developed his metaphysics (nascent in 1629 and fully mature by 1641) largely in response to the question: in what sense can the results he had achieved through his hypothetical method be understood to be true (i.e. to correspond to the nature of reality in itself)? His answer was: They can be true only if they are understood as resting on his newly formulated onto-theological first philosophy. Thus we can understand Descartes' first philosophy properly only if we understand the question to which it was a response, and we can understand this question properly only if we understand his earlier, hypothetical vision of natural science – the vision that he articulated in his *Regulae ad directionem ingenii*. The whole project thus depends on a proper interpretation of the *Regulae*; and it is to this issue that the present essay is devoted.

Descartes worked on the *Regulae* sometime during the years 1619–1628.² Upon moving to the Netherlands at the end of 1628, he abandoned it,

¹Martin Heidegger, *What is a Thing?*, translated by W. B. Barton, Jr and Vera Deutsch (Chicago, 1967) 101.

²I quote Descartes according to the edition of Charles Adam and Paul Tannery: *Oeuvres de Descartes* (Paris: Cerf, 1897–1913 / Paris: Vrin, 1964–1974). Henceforth: AT (= Adam and Tannery) volume number, page number. All translations are my own.

leaving it in the form of an incomplete and very rough draft.³ He never published it and never referred to it in his later writings. Descartes thus seems to have viewed the *Regulae* as an immature and unsuccessful exercise. Nonetheless, Descartes scholars today universally recognize its importance: virtually every serious study of his work includes some more or less thorough consideration of it.⁴ However, this attention has failed to produce even a small fraction of the fruits that might be gained from it.

I begin by reviewing the literature of the last forty years or so, with an eye toward determining the causes of the shortfall just mentioned. On my diagnosis, the principal cause is the ‘patchwork theory’ advanced by Jean-Paul Weber.⁵ Based on exhaustive textual analysis, Weber argued, and succeeded in persuading most scholars, that the *Regulae* is an inconsistent set of fragments which Descartes composed at various stages and then carelessly stitched together. Given the central claim and extensive influence of Weber’s study, it is hardly surprising that a fruitful framework for reading the *Regulae* has remained an unrealized possibility. For if indeed the *Regulae* is incoherent, we can hardly hope to gain much from studying it.

Despite its many imperfections and local inconsistencies, globally the *Regulae* is not only coherent, but also advances a compelling vision of the proper goals and methods of scientific inquiry. I do not aim here fully to portray, much less defend, this vision; different readers may very well disagree about its precise contents and about its merits. In section 2, I do, however, aim to show how the *Regulae* can be read as a coherent work – and indeed, to a large extent, as if it were also complete. It is possible to do so largely because in two places in the extant text Descartes outlines the plan of the work as he at one time envisioned it. This is my first main proposal, and it ought to be an unsurprising one: we ought to approach the various parts and details of the *Regulae* as pieces of the whole – that is, as elements of the

³The key document for this transitional period in Descartes’ career is his letter to Mersenne of 15 April 1630, in which he writes:

You may find it strange that I have not persevered with the treatises I began while in Paris [presumably, the *Regulae*, and perhaps some other drafts]. The reason is that, in the course of working on them, I acquired a little more knowledge than I had when I started, and when I tried to take this into account I was forced to start upon a new project, more extensive than the first [presumably, *Le Monde*].

(AT I, 137–8)

On this period in general, see Stephen Gaukroger, *Descartes: An Intellectual Biography* (Oxford, 1995) 181–7.

⁴See for example: Lilli Alanen, *Descartes’ Concept of Mind* (Cambridge, 2003); Lüder Gäbe, *Descartes’ Selbstkritik: Untersuchungen zur Philosophie des jungen Descartes* (Hamburg, 1972); Daniel Garber, *Descartes’ Metaphysical Physics* (Chicago, 1992); Gilles Olivo, *Descartes et l’essence de la vérité* (Paris, 2005); Dennis L. Sepper, *Descartes’s Imagination: Proportion, Images and the Activity of Thinking* (Berkeley, 1996).

⁵Jean-Paul Weber, *La constitution du texte des Regulae* (Paris, 1964). Translations from the French are my own.

big picture which Descartes himself quite adequately sketched out in his plans for the work.

In section 3, I examine in some detail, and call into question, what Weber puts forward as the strongest proof of his thesis. Weber argues that Rule IV consists of two incompatible parts, which he calls IV-A and IV-B. Furthermore, he claims that IV-B, in which Descartes discusses his notion of *mathesis universalis*, was an early draft that does not properly belong to the body of Rule IV nor, indeed, to the rest of the *Regulae*.⁶ It is crucial for my project that this claim be rejected; for, together with the two passages in which Descartes discusses the plan of the work, his notion of *mathesis universalis* is the best key we possess for unlocking the content of the *Regulae*. On his conception, *mathesis universalis* has two aspects: (a) the claim that, in order to solve problems algebraically, the mathematician may largely disregard the differences between arithmetic and geometry; (b) the claim that the entire realm of physical phenomena may fruitfully be studied according to a single, essentially mathematical method.⁷ It turns out that aspects (a) and (b) of *mathesis universalis*, thus conceived, provide, respectively, the subject matter for Books II and III of the *Regulae*. Indeed, according to the framework here proposed, the *Regulae* deserves to be regarded as a coherent work most evidently because it can be read as a treatise on the presuppositions, goals and methods of *mathesis universalis*.

1. ISSUES IN THE SECONDARY LITERATURE

As mentioned above, in so far as my intention in this essay is negative, its principal target is Weber's 1964 exercise in textual criticism. My response to Weber may be compared to H. J. Paton's response to the work of Vaihinger and others on Kant's *Critique of Pure Reason*. Indeed, I take the term 'patchwork theory' directly from Paton, who used it to label the basic claim made by his opponents.⁸ Following a parallel path, as Paton found Vaihinger's, I find Weber's patchwork theory viciously self-confirming.⁹

⁶Weber, 7–11. This view has been echoed by Pamela Kraus, 'From Universal Mathematics to Universal Method: Rule IV of the *Regulae*', *Journal of the History of Philosophy*, 21 (1983): 159–74. Kraus contends:

Only when we see that the universal method of IV-A is not confined to the restricted scope of *ordo et mensura*, as universal mathematics in IV-B is, can we appreciate that IV-A alone belongs to Rule IV, and that the *Regulae* is a philosophical treatise [i.e. not a narrowly mathematical or scientific one].

(172)

⁷See Rule IV (AT X, 377–8). The relevant passage is quoted in full below.

⁸Herbert James Paton, *Kant's Metaphysic of Experience*, 2 vols (Bristol, 1936), vol. I, p. 38.

⁹Paton states his basic objection to Vaihinger as follows.

The essence of criticism, and the only way in which we can penetrate more deeply into the mind of an author, is to check our interpretation of one passage in the light of another, until gradually the whole becomes clear. If our interpretation is contradicted

Much like Paton, I also find there is little point in untangling the tangled web which the patchwork theorist has woven. The wise thing, instead, is to show positively the large extent to which the work in question has a coherent doctrine.¹⁰ Finally, again following Paton, in my effort to render Descartes' *Regulae* the sort of service which he rendered Kant's *Critique*, my guiding principle is to relate the details of the text to the idea of the whole.¹¹

However, several differences between my situation and Paton's ought to be noted. In comparison with Paton, I have both some disadvantages and some advantages. The main disadvantage is that Descartes never completed the text of the *Regulae* and never prepared it for publication. The main advantage is that Descartes' text (unlike Kant's) is about something to which we have, quite apart from the text itself, independent and reliable access. In this regard, echoing Spinoza's (and, incidentally, Leo Strauss's) words in a very different context, we may say that the *Regulae* is rather a more intelligible text (and more like Euclid's *Elements*) than Kant's *Critique*; and that, by comparison, the latter work is more 'hieroglyphic' (and more like the Bible).¹² For the *Regulae* is indeed about something: it is about Descartes' early work in mathematics and physical science. To these subjects we have access not only in the matters themselves (e.g. the sorts of difficulties that arise in connection with a series of magnitudes in continuous proportion),¹³ but also in Descartes' correspondence and in his later works; for the results which he later published, most notably in his *Geometry* and

by other passages, we are compelled to reconsider it, and so we may come nearer the truth. On the patchwork theory there is no such compulsion, and the way is open for purely subjective impressions. Indeed if an interpretation is contradicted by what Kant says elsewhere, the commentator merely notes a further confirmation of the patchwork theory; and the number of contradictions which he can find is limited only by his capacity for misunderstanding Kant.

(42–3)

¹⁰See Paton, 42.

¹¹Paton takes this principle from Kant himself, who writes in his preface to the *Prolegomena* as follows.

In every writing, above all when it proceeds as a free discussion, it is possible to ferret out apparent contradictions, by comparing isolated pages torn from their context. Such apparent contradictions cast a prejudicial light upon it in the eyes of those who depend upon criticism at second hand, but they can be easily solved by any one who has mastered the idea as a whole.

(cited by Paton, 37)

¹²In the *Tractatus Theologico-Politicus*, Spinoza says that in order to interpret many passages in the Bible (namely, those that deal with 'matters beyond normal comprehension'), we must employ a historical method; in contrast, he says, the subject matter of a purely intelligible book (such as Euclid's *Elements*) can be grasped directly. See Spinoza, *Opera*, 4 vols, edited by Carl Gebhardt (Heidelberg, 1925), vol. III, p. 111. Commenting on this passage, Leo Strauss calls the Bible 'a hieroglyphic book' in order to indicate the essential unintelligibility which Spinoza finds in it. See Leo Strauss, 'How to study Spinoza's *Theological-Political Treatise*', in *Persecution and the Art of Writing* (Chicago, 1952) 148.

¹³See Rule VI (AT X, 384–7).

Optics (1637), were largely achieved during the 1620s (i.e. precisely the period during which he composed the *Regulae*). It is in connection with this fact that I offer my second main proposal: we should approach the *Regulae* not so much by scrutinizing the text as by contemplating its subject matter.

However, now, since I want to share in the benefits of an analogy with Paton, it seems I must also share in its burdens. In particular, one might object that subsequent scholarship has vindicated Paton's opponents, for we can now see that there are indeed some rather deep (and perhaps unsolvable) problems in Kant's First Critique; it seems likely, then, that future (and perhaps even existing) scholarship will vindicate Weber's work and indict mine. In anticipation of such an objection, I would like to make two points. First, Paton never denied that Vaihinger and his cohorts made an important contribution, and I by no means want to deny that Weber has done so. Through careful textual analysis, the critics of Kant – and those of Descartes – have elevated scholarship by laying down a difficult challenge and by posing many questions that demand serious consideration. Thus, in retrospect, the best twentieth-century work in English – *The Method of Descartes* by L. J. Beck – appears naively uncritical, since Beck had not the advantage of being obliged to respond to Weber's challenge.¹⁴

Second, I by no means intend to deny that there may perhaps be some deep difficulties in Descartes' *Regulae*. Here, it is important to make a distinction between two levels of research. First, in the history of philosophy, we are interested in what the great writers of the past meant to say. Second, in philosophy proper, we are interested in whether what people say is true. On the first level, it is vitally important that we have something coherent to say about what Descartes (and what Kant, etc.) meant to say. Here the principle of charity ought to be applied – even, perhaps, to a fault. On the second level, we owe no charity to anyone – perhaps least of all to our friends. However, proper procedure requires that we work carefully through the first level before attempting to enter the second. Otherwise we risk wasting our time on superficial problems – problems which perhaps we ourselves have fabricated by failing to read our sources with sufficient care.¹⁵

¹⁴L. J. Beck, *The Method of Descartes* (Oxford, 1952).

¹⁵I am thinking here of R. G. Collingwood, *An Autobiography* (Oxford, 1938). He suggests that the contradictions which readers claim to detect in a text may very well 'be the fruit of their own historical errors' – that is, their failure to identify the question the author was trying to answer (42). Collingwood condemns the distinction which many readers make between meaning and truth not because he wants to evade the question of truth, but because in his view many such readers fail to determine the meaning of a proposition by the proper historical method (68–72). However, given the fact that his understanding of truth is historical, Collingwood does make an important distinction between the (a-historical) truth of a proposition and the 'rightness' of an answer to a question (37–8). Following Collingwood, what I really mean to say above is that we ought to distinguish between (a) what a philosopher meant to say; and (b) whether the philosopher gave the 'right' answer to his or her question.

The most obvious problem that we encounter in Descartes' *Regulae* concerns the extent to which he had a universal method. On this question, Weber brings forward all the right information, but draws the wrong conclusion. The required information is found in two texts external to the *Regulae*. The first is a letter which Descartes wrote to Isaac Beeckman on 26 March 1619.¹⁶ In it, Descartes writes:

I want to offer, not Lull's *Ars brevis*, but a completely new science, by which all those questions can generally be solved that can be proposed in any genus of quantity, whether continuous or discrete.¹⁷

The second relevant text is the account found in Baillet's *Life* of the dreams which Descartes had some eight months later on 10 November 1619.¹⁸ In this account, we find Descartes 'occupied with the thought of having found that day the foundations of a marvelous science ...' and then having three consecutive dreams.¹⁹ In the third dream, Descartes encounters two books: the first, a dictionary, which he takes to represent 'the Sciences gathered together'; the second, a collection of poetry, which he takes to represent 'Philosophy and Wisdom joined together'.²⁰

Weber uses these two texts as guideposts for dating the composition of the early Rules. But they also have symbolic value: they can be taken to represent the 'two principal methodological currents [which] together occupied the attention of the young Descartes ...'.²¹ What Weber takes to be the oldest strand – the one that finds expression in the dreams of 10 November 1619 – stems, it seems, from an 'innate sagacity' which Descartes early on noticed in himself, and constantly strove to develop, for solving all sorts of problems.²² In this regard, Descartes' project was admirably ambitious, but had a serious deficiency – namely, 'the lack of precision in its details'.²³ The other strand 'presents itself as an efficacious technique, adapted to the solution of a large set of problems of a determinate genus';²⁴ in particular, for the early Descartes, these techniques were strictly mathematical in character. In view of this evidence, Weber wisely concludes:

Many facts that are at first puzzling in the evolution of the Cartesian method can be explained definitively by its double origin: a 'sagacity' with boundless

¹⁶AT X, 154–60.

¹⁷AT X, 156–7.

¹⁸Adrien Baillet, *La Vie de Monsieur Descartes*, 2 vols (Paris, 1691) vol. I, pp. 80–6; reproduced in AT X, 180–8.

¹⁹AT X, 181.

²⁰AT X, 184.

²¹Weber, 209.

²²On Descartes's 'innate sagacity', see Rule X (AT X, 403–4). The relevant passage is quoted in full below.

²³Weber, 210.

²⁴*Ibid.*

ambitions, but vague, joined little by little, to its benefit, to a restrained, but precise 'technique' which elaborates itself upon contact with mathematical realities.²⁵

If, indeed, Descartes' method springs from such a double origin, we should be able to see in his methodological writings a constant dialectic at work between these two poles; and there should be no need to suppose the existence of distinct and contradictory stages. In fact, we do encounter a dynamic tension between these two poles both in his early and in his later writings. In letters from the spring of 1619, we find that Descartes had an interest *both* in the 'boundless ambitions' of a universal method, such as the one Lull claimed to have, *and* in effective mathematical techniques.²⁶ Similarly, in the *Discourse on Method* (1637), we find four general (and distressingly vague) precepts, followed by elucidations that are strictly mathematical in character.²⁷ Thus, despite the fact that in some passages Descartes *says* that his method is a well-defined procedure (something that can straightforwardly be applied to any given problem like a corkscrew to a bottle),²⁸ in general we find him quite unselfconsciously *showing* that what he does have is a set of strategies that share some strong family resemblances. The resemblances get expressed in general precepts, and the techniques are embedded in the particular, concrete problems with which Descartes was concerned. In accord with this picture of Descartes' method, we should imagine the methodical scientist circulating through the following three stages:

1. active engagement in particular, concrete inquiries;
2. reflection on his or her successes and failures in order to formulate general strategies;
3. (re)application of these strategies to ever wider fields of research; return to stage (1).

Therefore, applying the principle of charity, we may affirm that this is what Descartes consistently *meant to say* when he claimed to have a method; it is another question whether or not this claim has any genuine scientific value.

It is among other things to this question that John Schuster, the most significant interpreter to follow in Weber's footsteps, addressed his efforts;

²⁵Ibid.

²⁶In addition to the letter of 26 March 1619 cited above, see the letter of 29 April, in which Descartes asks Beeckman to investigate a person claiming to have a general method for solving all sorts of difficulties (AT X, 164–5).

²⁷See *Discourse on the Method*, Part II (AT VI, 18–21).

²⁸For example, in Rule IV, Descartes writes, 'By method I mean reliable rules which are easy to apply, and such that if one follows them exactly, one will never take what is false to be true or fruitlessly expend one's mental efforts ...' (AT X, 371–2).

and to it he issued an unambiguous and rather strident nay.²⁹ Schuster endorses Weber's genetic account and gives it two innovative twists. First, he begins with strong assumptions about the way in which science actually is (or should be) conducted.³⁰ These assumptions imply that, wherever it veers toward generality, Descartes' methodological discourse becomes empty and at most provides Descartes with a convenient 'cover story'.³¹ In contrast, when Descartes turns to the particularities of some concrete investigation, on Schuster's view we always encounter 'a dense local disciplinary culture ...'.³² In this regard, Schuster does not require Weber's developmental stages: he might simply have claimed that, over a long period of time, Descartes more or less continuously suffered from delusions about the possibility (and desirability) of a general method.

The second twist is that Schuster is interested not only in how Descartes developed the *Regulae*, but also in why he abandoned it. In summary, the story he tells goes like this. Descartes began with naive confidence in *mathesis universalis* (Rule IV-B, in 1619) and then elaborated his enthusiastic vision of a universal method (Rule IV-A, and most of Rules I–XI, in 1619–20).³³ Upon returning from his travels in 1625, Descartes became involved in the turmoil of Parisian intellectual life – a turmoil that involved, among other things, sceptical doubts about the possibility of genuine knowledge.³⁴ On Schuster's account, Descartes responded to this turmoil by attempting, in the remaining Rules, to legitimate his project in universal mathematics (both his particular achievements and his general method) by lending 'ontological certification' to its objects.³⁵ However, for a variety of reasons, the project failed and succeeded only in raising new problems.³⁶

²⁹In his influential dissertation, Schuster sets out, *inter alia*, to explain how Descartes 'could genuinely believe in the reality and efficacy of his method despite the fact that the notion of an efficacious universal method is and must be an illusion'. See John A. Schuster, *Descartes and the Scientific Revolution, 1618–1634 [Descartes]* (unpublished dissertation, 1977) 227. This passage nicely indicates Schuster's dogmatic stance against method.

³⁰In a later article, Schuster aims to 'liberate us from the myth of method in the history of science'. See John A. Schuster, 'Whatever should we do with Cartesian Method? Reclaiming Descartes for the History of Science' ['Cartesian Method'], in *Essays on the Philosophy and Science of René Descartes*, edited by Stephen Voss (Oxford, 1993) 203.

³¹Having offered his reconstruction of the way in which Descartes arrived at the law of refraction, Schuster suggests that Descartes' method-discourse in Rule VIII (where the conditions for making this discovery are discussed) may be dismissed as a methodological 'cover story' (*ibid.*).

³²*Ibid.*

³³John A. Schuster, 'Descartes' *Mathesis Universalis*: 1619–28' ['Mathesis'], in *Descartes: Philosophy, Mathematics and Physics*, edited by Stephen Gaukroger (Sussex, 1980) 54.

³⁴*Ibid.*, 55–7.

³⁵*Ibid.*, 59.

³⁶According to Schuster, the legitimizing project of the later Rules had two branches: (a) Rule XII: the network between optics, psychology and physiology (which he dubs 'the o-p-p nexus') was meant to show that the objects of Descartes' theory of light are identical with the real

There is a general consensus among scholars that, just as Schuster suggests, when Descartes moves to Holland in 1628 and begins work on *Le Monde*, he ceases to be essentially a mathematical problem-solver and starts to become a metaphysical system-builder.³⁷ However, to read this later shift back on to the *Regulae* is to risk distorting it. Indeed, it seems to me, in his desire to tell a compelling story about the development (and abandonment) of the *Regulae*, Schuster fails to attend to its distinctive character.³⁸ Worse still, in consequence he misses the crucial problem, namely: what can physics be when it espouses the hypothetical method of the 'subordinate' mathematical disciplines (e.g. optics and astronomy) and divorces itself from physics as Aristotle had understood it (i.e. as the study of what it is to be a thing of some definite natural kind, e.g. an animate as opposed to an inanimate being)?³⁹

Entering into this question would take us beyond the limits of the present study. But Schuster's suggestion that the problem of the *Regulae* is at bottom an ontological one leads us conveniently to the last major interpretation which our survey is obliged to consider – namely, that advanced by Jean-Luc Marion. Marion correctly diagnoses Weber's genetic account as an attempt to evade the real difficulties of Descartes' text.⁴⁰ His proposed alternative is that we read the *Regulae* in relation to an external point of reference – namely, in relation to Aristotle.⁴¹ In short, Marion reads the *Regulae* as Descartes' undercover attempt to overturn Aristotle's metaphysics.⁴² This leads him, among other things, to interpret *mathesis*

objects of perception (ibid., 62 ff.); (b) Rules XIV–XVIII: the geometrical representation of mathematical operations was supposed to 'establish the truth of [these] operations and the ontological status of their objects' (ibid., 71). Similarly, Jacob Klein maintains that the purpose of Descartes' method in the *Regulae* was to justify the identification of the object of Cartesian mathematics with the true object of physics. See Jacob Klein, *Greek Mathematical Thought and the Origin of Algebra*, translated by Eva Brann (New York, 1992) 198; also 294 (note).

³⁷Schuster, 'Mathesis', 73–80. Also see Daniel Garber, *Descartes Embodied: Reading Cartesian Philosophy through Cartesian Science* (Cambridge, 2001) 50.

³⁸I would argue that: (a) during the period of the *Regulae*, Descartes, like his cohort Mersenne, was happy to entertain a hypothetical and instrumental conception of physics; (b) on this conception, the project of the *Regulae* is perfectly coherent and quite successful; (c) there are no indications, within the *Regulae*, that Descartes was unhappy with this conception; so Descartes' rejection of this conception coincides with (and does not precede) his abandonment of the *Regulae*. Schuster is well aware of Mersenne's position and of Descartes' possible affinity with it (Schuster, *Descartes*, 35–46). These pages include well-taken critical remarks on Richard Popkin's account of the period and the latter's notion of 'mitigated skepticism'. See Richard H. Popkin, *The History of Scepticism from Erasmus to Spinoza* (Berkeley, 1964) chs 7, 9 and 10. On this transitional period in Descartes' career, also see Gaukroger, *Descartes*, 181–90.

³⁹Schuster considers, but rejects, the possibility that Descartes' account of perception in Rule XII (and thus the entire o-p-p nexus) is hypothetical. In order to do so, he (unconvincingly) attempts to explain away the passages in which Descartes quite clearly suggests that this account is hypothetical (Schuster, 'Mathesis', 61–2). See Rule XII (AT X, 412; 417).

⁴⁰Jean-Luc Marion, *Sur l'Ontologie Grise de Descartes* (Paris, 1975) 17.

⁴¹Ibid., 18–19.

⁴²Ibid., 179–90.

universalis as a meta-mathematical discipline designed to supplant First Philosophy.⁴³ For taking this position, and for suggesting that *mathesis universalis*, thus understood, is essentially identical with Descartes' universal method, Marion has been justly taken to task.⁴⁴ However, the basic problem with Marion's reading is that, in his attempt to uncover what lies beneath, he neglects the surface and fails to consider what (in its negative aspect) the *Regulae* most obviously is – namely, an attempt to overthrow Aristotle's logic and physics. Undeniably, this attempt has metaphysical implications. In order to specify them, we have first to determine why Descartes' new vision of scientific inquiry required the overthrow of Aristotle's logic and physics; and doing so in turn requires that we characterize his new vision of scientific inquiry in precise terms. All these prerequisites are ignored by Marion in his rush to tell the grand story of Descartes' part in the fateful forgetting of Being.

More recently, Stephen Gaukroger has collated the developmental accounts of Weber and Schuster in his intellectual biography of Descartes⁴⁵ and, in an important review, has taken John Shea to task for neglecting the genetic angle.⁴⁶ Shea's response is much to the point; but in his own account he offers not much more than a summary of Beck's earlier study, which now appears, for reasons mentioned above, rather naïvely uncritical.⁴⁷

2. THE IMPERFECT TEXT OF THE *REGULAE* AND THE PROJECTED WHOLE

In the introduction to his critical edition, Giovanni Crapulli tells us that the *Regulae* was explicitly mentioned for the first time in an inventory of Descartes' papers that was drawn up on 14 February 1650, three days after the philosopher's death in Sweden. Then, around the turn of the century, we

⁴³Ibid., 64.

⁴⁴Van De Pitte argues, in agreement with Marion, although from a different angle, that for Descartes *mathesis universalis* is a meta-mathematical discipline and that, as such, it may be identified with his universal method. Van De Pitte's argument is less mystifying but no more convincing than Marion's; it turns primarily on the generality of the Greek term *mathesis*, which refers to the act or process of learning any given subject matter. See Frederick P. Van De Pitte, 'Descartes' *Mathesis Universalis*', in *René Descartes: Critical Assessments*, 4 vols, edited by Georges J. D. Moyal (London, 1991), vol. I, pp. 61–79. For objections against this interpretation of *mathesis universalis*, see Kraus, op. cit., 167–9; see also Chikara Sasaki, 'Descartes' Mathematical Thought' (unpublished dissertation, 1989) 266–72.

⁴⁵Gaukroger, *Descartes*, 111–26; 152–81.

⁴⁶Stephen Gaukroger, 'Descartes Savant', *Metascience*, 4 (1993): 23.

⁴⁷See Shea's response in *ibid.*, 29–31. For Shea's own account see William R. Shea, *The Magic of Numbers and Motion: The Scientific Career of René Descartes* (Canton, MA: Science History Publications, 1991) 121–47.

lose all traces of the original manuscript. Leibniz's copy (designated by the letter 'H' for the Hanover library), with some corrections in his own hand, was discovered in the second half of the nineteenth century; Charles Adam and Paul Tannery consulted it in preparing their *Oeuvres de Descartes* (1908). The principal source for the Adam and Tannery edition of the *Regulae* (in AT X), however, was what had long been presumed to be the first published edition – the edition that was issued in Amsterdam in 1701 (and is thus designated by the letter 'A'). Both H and A are in Latin; but the earliest edition was in fact a Dutch translation published in 1684 (and designated by the letter 'N'). Adam evidently knew of this edition, but ignored it in preparing the AT edition.⁴⁸ Crapulli's edition (1966), in contrast, draws on all the available sources, weighs them carefully, and is thus most likely the best edition of the *Regulae* we can hope to have.

However, according to Crapulli, none of the three versions (A, H and N) on which he draws depends directly on the original. To be more precise, in his judgement all the versions we have are copies of an imperfect copy which stands between them and the lost original. Supposing the existence of such a 'medium', Crapulli suggests, is the best way to explain 'the presence in all three sources of the same omissions, errors and contested passages'.⁴⁹ Despite their overall similarity, there are some fairly significant differences between the three versions. Wherever relevant, these shall be noted as we proceed.

The *Regulae* is thus obviously *imperfect* in the sense that we have no definitive version of the text in the form that Descartes originally gave it. The text we do have is also obviously *unfinished*, for in Rule VIII Descartes suggests that the work he envisioned was to consist of three books (AT X, 399), and in Rule XII he specifies that each of these books was to consist of twelve Rules (429). As Descartes at one time envisioned it, the *Regulae* was thus to consist of thirty-six Rules; but the text we have breaks off after Rule XXI, and the last three Rules (XIX–XXI) are merely stated without the usual accompanying elaboration. Therefore, we have a complete Book I, an incomplete Book II, and none of the projected Book III. Nonetheless, I argue that it is possible to reconstruct the whole in such a way that, to a large extent, we can interpret the *Regulae* as if it were a complete and coherent work.

The first step is to gain an overview of the whole, and I begin by examining the passages in which Descartes sketches out the plan of the work. The first such passage occurs at the end of Rule VIII; a more detailed plan is offered at the end of Rule XII. Apart from a difference in

⁴⁸René Descartes, *Regulae ad directionem ingenii*, edited by Giovanni Crapulli (La Haye: Martinus Nijhoff, 1966) xviii–xix.

⁴⁹*Ibid.*, xxii.

terminology (to be discussed below), these two plans are largely consistent with one another. However, the Rule XII plan uses terms which it would be difficult to discuss at this stage.⁵⁰ Here, I shall refer to the Rule XII plan only where doing so allows me to fill in some helpful details.

Rule VIII as a whole is organized around the question ‘What is human cognition and how far does it extend?’ (AT X, 397). The two parts of the question suggest two domains of inquiry: (a) the powers of human cognition and (b) its possible objects. It should not be difficult, Descartes maintains, to survey our powers of cognition; after all, they are *our* powers, and we are perfectly familiar with them!⁵¹ If we today do not share Descartes’ confidence in this regard, it is in any case easy to understand *his* confidence – for he provides in his enumeration nothing more than a standard list of Aristotelian faculties: intellect, imagination, sense-perception and memory (398). Descartes’ confidence with regard to the objects of cognition is startling: nothing, he maintains, not even the entire universe, is ‘so many-sided and diffuse that it cannot be circumscribed within definite limits or arranged under a few headings’ (ibid.).

However, Descartes introduces an important limitation on his own enterprise: things themselves, he says, ought to be regarded in this context ‘only in the way that they are reached by the intellect’; and it is only in this sense that Descartes claims to be able to arrange them under two main headings:

We come at last to things themselves, which are to be regarded only as they are reached by the intellect [*prout ab intellectu attinguntur*]; in which sense we divide them into the most simple natures and complex or composite natures.
(AT X, 399)

Descartes is not claiming to have insight into the basic elements out of which things themselves are composed. Rather, he claims to have insight into the sorts of things that are ‘basic’ for us in such a way that through them we can ‘proceed to knowledge of all the rest’.⁵² Those aspects of reality which our

⁵⁰The Rule XII plan is governed by the notion of a *quaestio* (AT X, 428–30). Briefly, a ‘perfectly understood *quaestio*’ is one in which we can state all the necessary (and hence jointly sufficient) conditions for determining an unknown; mathematical questions are largely of this type, and Descartes proposes to treat them in Book II of the *Regulae*. In contrast, an ‘imperfectly understood *quaestio*’ is one in which we can arrive at conditions that may be sufficient, but not necessary. Physical theories are largely of this sort, and Descartes proposes to treat them in Book III. This passage provides strong confirmation for the plan I derive here from the passage in Rule VIII.

⁵¹‘It should not be regarded a difficult matter to define the limits of the mental power [*ingenium*] we are conscious of in ourselves, since we often do not hesitate to judge even of things that are outside us and completely unfamiliar’ (AT X, 398).

⁵²In Rule V, Descartes says his goal is to reduce complicated propositions down to simpler ones so that, ‘starting with the intuition of the simplest ones of all, [he can] ascend to knowledge of all the rest’ (AT X, 379).

intellect illuminates clearly enough for them to be considered 'basic' in this sense are Descartes' simple natures; they are simple in the order of knowledge, not in the order of being.⁵³

Having divided the objects of cognition into simple and composite natures, Descartes subdivides simple natures into (a) those that are spiritual, (b) those that are corporeal, and (c) those that are common (AT X, 399). In Rule XII, Descartes specifies that common simple natures are concepts such as 'existence, unity, duration and the like' (419). These concepts are 'common' in the sense that something corporeal (say, a candle) may exist, have unity (candles are things we can count) and duration; and so also may something spiritual (say, a thought or wish).⁵⁴ By calling certain simple natures 'common', Descartes is not asking us to regard certain things as being both corporeal *and* spiritual. Furthermore, by making this subdivision, Descartes does not claim to know, or ask us to accept, that in fact everything in the universe is either spiritual or corporeal (i.e. he is not asserting an exclusive disjunction).⁵⁵ Rather, he claims to know, and asks us to accept, that if we want to achieve a certain kind of *scientia*, we must for scientific purposes consider any given thing as either spiritual or corporeal (and not both).

In Rule XII, Descartes changes his terminology and speaks instead of 'intellectual' and 'material' simple natures (AT X, 419). In this context, it is clear that intellectual natures (such as 'what knowledge or doubt or ignorance is, or the action of the will') are known by reflection 'without the aid of any corporeal image' (ibid.). In contrast, it is clear that, according to Descartes, whenever we study material nature, we must have recourse to images.⁵⁶ Thus, with regard to the techniques that are to be employed in

⁵³In Rule XII, Descartes himself distinguishes between two perspectives on things – for example, a body with extension and shape, viewed 'from the side of the thing' [*a parte rei*] is 'something one and simple'; however, 'with respect to our intellect' [*respectu ... intellectus nostri*] we say that it is composed of three natures – the nature of body, of extension and of shape (AT X, 418). There has been some debate about whether Descartes' simple natures should be given a realist or an idealist reading. See Marion, *Ontologie*, 141; Brian O'Neil, 'Cartesian simple natures', in Georges Moyal (ed.), *René Descartes: Critical Assessments*, 4 vols (London, 1991), vol. I, pp. 118–37. On my reading, Descartes is *both* a realist (in the sense that he thinks things really are extended and thus is no Kantian) *and* an idealist (in the sense that it is only by virtue of its peculiar power that the human mind is capable of thinking about extension in abstraction from every other feature of concrete reality).

⁵⁴The notion that there are such common natures also appears in the *Third Meditation*, where the meditator reflects, 'I perceive that I now exist, and remember that I have existed for some time; moreover, I have various thoughts which I can count; it is in these ways that I acquire the ideas of duration and number which I can then transfer to other things' (AT VII, 44–5).

⁵⁵Similarly, in the *Meditations*, although in the order of knowing Descartes rigorously distinguishes between *res extensa* and *res cogitans*, in the *Sixth Meditation* he argues for their substantial human and concludes that in reality human beings are simultaneously thinking *and* extended things (AT VII, 81).

⁵⁶'If ... the intellect proposes to examine something which can be referred to body, the idea of that thing must be formed as distinctly as possible in the imagination ...' (AT X, 416–17).

different areas, Descartes introduces a major division within his supposedly universal – and unitary – method.⁵⁷

Note that all the intellectual natures which Descartes enumerates are powers of the mind; he does not mention – in this context – the mind itself as a spiritual entity, or God. One might suppose that the shift in terminology (from ‘spiritual’ in Rule VIII to ‘intellectual’ in Rule XII) indicates a shift in Descartes’ thinking. This is an interesting hypothesis, but in Rule VIII Descartes never specifies what might fall under the heading of the ‘spiritual’. In any case, in the *Regulae* as a whole intellectual natures are generally considered under the heading of powers or instruments of knowing (that is, as belonging to the first-person subject of cognition) and not as objects of knowledge. The only exceptions are two metaphysical principles:

1. I am, therefore God exists;
 2. I understand, therefore I have a mind distinct from my body.
- (AT X, 421–2).

However, in the *Regulae*, Descartes only mentions these principles in passing and never develops them. Thus, with regard to the possible objects of knowledge, the *Regulae* as a whole deals almost exclusively with corporeal natures (that is, with things that can be understood on the basis of such simple natures as shape, extension and motion).

Because in the *Regulae* Descartes largely restricts his attention to corporeal nature, and because he understands corporeal nature in quantitative (or at least quantifiable) terms, we can already see that in this work he is primarily concerned with some kind of mathematical physics. Undeniably, in the *Regulae* Descartes also envisions the possibility of a scientific (i.e. certain and evident) metaphysics of God and the mind, but he never develops it. Thus, Descartes ought to be understood as offering a ‘universal’ method in the *Regulae* primarily in the sense that according to these Rules the entire physical world can and should be investigated by means of a single, essentially mathematical method.

Although in the *Regulae* Descartes clearly thinks he has a universal method in an even broader sense, the more narrow, physical method ought to be given priority. It is difficult to understand the logical terms in which Descartes discusses his method (terms such as ‘intuition’ and ‘deduction’) apart from examples of particular cases in which, according to Descartes, the mind intuitively certain things and deduces others. In the *Regulae* Descartes is primarily concerned with developing strategies for investigating corporeal nature. These strategies involve the use of imaginative representations and so, according to Descartes, should not be employed in the investigation of

⁵⁷In Rule I, Descartes asserts the unity of his method in the following terms: ‘The sciences as a whole are nothing other than human wisdom, which always remains one and the same, however different the subjects to which it is applied ...’ (AT X, 360).

spiritual natures.⁵⁸ The examples on which we depend for our understanding of Descartes' logic are largely irrelevant to the study of spiritual natures. With regard to the universality of Descartes' method, we are thus left with general notions (such as the intuition of simples and the deduction of composites) which we might later attempt to fill out with examples drawn from the *Meditations*; but it seems best to begin by attempting to understand these notions in the context in which they are first and most vividly presented – that is, as applied to corporeal nature.

I have introduced the distinction between simple and composite natures, and the subdivision of simple natures into the intellectual and the material. Descartes next distinguishes between two ways in which simple natures may come together to form composites. In Rule VIII, we find that, 'As for composite natures, there are some which the intellect experiences as composite before it decides to determine anything about them, but there are others which are put together by the intellect itself' (AT X, 399). As with the previous distinctions, this distinction is made for methodological purposes; for according to Descartes, 'there can be no falsity save in composite natures which are put together by the intellect' (ibid.). This distinction is fairly straightforward. Drawing on examples found in Rule XII, we may note that the intellect experiences bodies as having extension (i.e. size) and shape, and thus as being composed of (at least) these two simple natures, 'before it decides to determine anything about them'. Thus, according to Descartes, there can be no falsity in a judgment such as 'All bodies have a certain shape and size'. In contrast, we may very likely fall into error if we join to the nature of a horse the image of a single horn on the forehead, and if in so doing we suppose that there are unicorns somewhere in the depths of the forest. For composites that 'we ourselves compose' are liable to be faulty.

The final prerequisite we need is a distinction between two ways in which the intellect, on its own account, may put together composite natures out of simples. In Rule VIII, Descartes maintains that there are '(a) those that are deduced from natures which are the most simple and self-evident . . . and (b) those that presuppose others which experience shows to be composite in reality' (AT X, 399). Now we have all the terms in which Descartes first sketches the plan of the *Regulae*: composites of the first sort, he says, will be treated 'throughout the next book' (i.e. in Book II), while 'the whole of the third book' will be reserved for composites of the second sort (ibid.).

According to this plan, Book II of the *Regulae* deals with the deduction of composites from the most simple natures. What are they? We know from Rule II that according to Descartes arithmetic and geometry 'are concerned with an object so pure and simple that they make no assumptions that

⁵⁸In Rule XII, Descartes clearly states that, when investigating spiritual natures, if the intellect is not to be hampered by the other cognitive faculties, 'the senses must be kept back and the imagination must, as far as possible, be divested of every distinct impression' (AT X, 416).

experience might render uncertain ...' (AT X, 365). We may gather then that Book II deals with the deduction of composites from the 'pure and simple' object of mathematics. In contrast, Book III as projected was to be concerned with things 'which experience shows to be composite in reality' – that is, we may infer, with questions in physical science.

In what sense are the starting-points which experience yields 'composite'? Descartes' discussion of the jaundiced man in Rule XII suggests that the 'wise man' approaches experience by first separating out simple data from the rashly composed judgements we tend to form on the basis of ordinary sense-perception (AT X, 423). The wise man begins by separating out, for example, the simple datum 'Everything looks yellow' from the complex claim 'Things are in fact yellow'. This latter claim is complex in the sense that (returning to the terms employed in Rule II) it makes an assumption that further experience may render uncertain. That is, the man who makes it may later realize that things look yellow *to him* only because of his jaundiced condition. To take a more traditional – and more relevant – example, the methodical scientist begins from the simple datum 'The stick in water looks bent', and not from the unreflective assumption that the stick is in fact bent. We might also consider the question regarding the relative sizes of the sun and moon. In all of these examples, we can see that the data of experience are 'composite' in the sense that with regard to them a distinction can be made between appearance and reality.

In contrast, to introduce a line segment in (Euclidean) geometry just is to understand that the line in question is straight – even if the representation of it in the diagram we are using is not. It is also to understand that a line precisely as such represents only one dimension – length – even though every line we draw also has a certain breadth. Thus, the line segments geometry deals with are 'simple' in the sense that with regard to them no distinction between appearance and reality can be made, and in the sense that they are one-dimensional.

In what sense can geometrical composites be 'deduced' from such simple starting-points? We may begin to understand what Descartes means by 'deduction' in this context by pairing it with the 'reduction' he mentions in the opening sentence of the *Geometry*. There Descartes boldly claims that 'All the problems of geometry can easily be reduced to such terms that afterwards all that is needed to construct them is to know the length of some straight lines' (AT VI, 369). What is meant here by 'reduction' and 'deduction'? A complex figure (say, a conic section such as a parabola) can be deduced from simple natures in the sense that we can represent it by means of an algebraic formula – that is, for any abscissa (segment along the x -axis), we can construct the corresponding ordinate (segment perpendicular to the abscissa and thus parallel to the y -axis) in a finite number of precise steps. Such deductions are possible only in the language of Descartes' algebra; and before Descartes could elaborate this language (in the first few pages of the *Geometry*) he had to figure out how in general all (or at least

many) of the complex objects of traditional geometry could be reduced to sufficiently simple starting-points. The insights that made this reduction possible, on my reading, constitute the subject matter of Book II of the *Regulae*. The *Geometry* itself discusses and shows by example how Descartes' algebraic language can be used to solve a wide variety of problems (i.e. how a broad range of geometrical composites can be deduced from remarkably simple starting points). Thus we can, to a large extent, interpret Book II of the *Regulae* as if it were complete. We can do so by reading the existing Rules in light of the *Geometry*, and vice versa.

I have already suggested that the composites to be treated in Book III of the *Regulae* were physical phenomena such as light. Light is a complex phenomenon most obviously in the sense that it has many features (or 'dimensions') which we might want to investigate: it illuminates, it heats, it reflects, refracts, seems to travel instantaneously, etc. In his *Optics*, Descartes generally isolates refraction from all the other features or 'behaviors' of light. We have also already identified another sense in which such phenomena are composite: with regard to them a distinction between appearance and reality can be made. We might even say that the phenomenon of refraction, for example, appears as a problem for physical science only as a result of our making this distinction. If we failed to make it, and remained caught in the assumption that sticks in water are in fact bent, we would remain the victims, as it were, of refraction, and would never become observers of it. Once we make the distinction between appearance and reality, we can begin to investigate the relationship between them. Descartes' first step was to observe refraction through prisms with the help of an experimental set-up such as the one depicted in the Tenth Discourse of the *Optics*.⁵⁹

One advantage of this set-up is that it allows the scientist to observe refraction from, as it were, the sidelines and thus to avoid becoming a 'victim' of it. For in the case of the apparently bent stick in water, our visual data have the character they do *as* a result of refraction, while in the case of prisms observed from the sidelines, the phenomenon of refraction *is included* among our visual data. As we can already see from the fact that it is easily depicted in a two-dimensional diagram, this experimental set-up also naturally lends itself to geometrical treatment. Once we have depicted it in two-dimensional figures, the results obtained from this experiment can be subjected to questions of the sort dealt with in Book II of the *Regulae*. In particular, we can now ask: For a given transparent medium, what mathematical function-formula expresses the regular relationship between the inputs (the angles of incidence) and the outputs (the corresponding angles of refraction)?

From passages in the existing Rules, we can gather that the task of the projected Book III was to discuss strategies for drawing out such precise mathematical questions from initially complex problem situations in

⁵⁹*Optics* (AT VI, 212).

physical science. We have a complete example of such an investigation in Descartes' *Optics*. In the existing Rules, we have a discussion of the same problem in Rule VIII (i.e. the problem of finding the anaclastic (AT X, 394–5)), and a rich collection of remarks on other problems (e.g. concerning magnetism and musical harmony (431)). Given this data, we can interpret not only Book III as if it existed, but also the *Regulae* as a whole as if it were complete. We can reconstruct and interpret the projected Book III by reading the existing Rules in light of the *Optics*, and vice versa.

3. WEBER'S PATCHWORK THEORY AND THE IDEA OF A *MATHESIS UNIVERSALIS*

Weber begins his study of the *Regulae* by noting one sense in which the text is 'imperfect' – namely, in the sense that we have several different versions of it. For example, in **H** a long section, which in the other versions is included in the body of Rule IV, is included only as an appendix to the *Regulae* as a whole. This section, which begins '*Cum primum ad Mathematicas disciplinas animum applicui ...*' (AT X, 374) and continues to the end of the Rule, Weber designates as 'IV-B'; IV-A is the first section of the Rule up to that point.⁶⁰ Now in Weber's view, such differences in the sources reveal a 'fault' in the *Regulae* in another sense – namely, that the text we have is a patchwork quilt of fragments composed at different periods in Descartes' development but stitched together – often quite carelessly – to form some kind of a treatise. Moreover, Weber aims to show that over the years in which these various fragments were composed, Descartes' thinking changed quite radically. Thus according to Weber, 'the *Regulae* offers not one method, but several, which succeed, perfect, or annul one another ...'.⁶¹ In particular, Weber claims that the strictly mathematical method of IV-B (the method governed by *mathesis universalis*) is succeeded, and annulled, by the fully universal method advocated in IV-A. Thus, according to Weber, *mathesis universalis* – the very notion that provides the cornerstone of my interpretation – belongs to an early stage in Descartes' development which was 'quickly surpassed'.⁶² To put it bluntly, then, if Weber is right, my interpretation ought to collapse.

Let us turn now to the details. Weber begins with four points which, he says, 'without being proofs properly speaking, already announce the lack of homogeneity' between IV-A and IV-B.⁶³ The first point is uncontroversial: IV-A uses the term '*methodus*' and never uses the term '*mathesis universalis*', while the reverse is true of IV-B. But Weber's second point is rather vague:

⁶⁰Weber, *Constitution*, 3.

⁶¹Ibid., 2.

⁶²Ibid., 10.

⁶³Ibid., 4.

he claims that 'IV-A does not need IV-B in order to make sense; and that, for its part, IV-B can be read and understood in total abstraction from IV-A'.⁶⁴ In one sense, this is plainly true: we can indeed, as Weber suggests, read IV-B without having read IV-A, and still get something out of it; and the same could be said of IV-A. How much do we have to get out of a text before we can properly be said to understand it? There are no precise criteria here. However, we might consider the fact that IV-A speaks of method in very general terms, and thus say it is impossible to understand what Descartes' method is without some notion of what it might mean to apply it. This is precisely what IV-B provides: an example of a domain of inquiry that might be more fruitful if pursued methodically. Conversely, IV-B is so concrete that we might read it and still not recognize it *as an example* of something more general: namely, of the benefits to be gained by approaching an area of inquiry methodically. For example, someone might understand it as an autobiographical piece on Descartes' early career in mathematics.

Weber's third observation is that there is a structural analogy between IV-A and IV-B: for example, IV-A begins by lamenting the role that chance often plays in scientific investigations (AT X, 371), while IV-B begins by criticizing the traditional way of studying arithmetic and geometry (374-5).⁶⁵ Without going into all the details, let it suffice to say that in fact the structural analogy between IV-A and IV-B is so strong that one is virtually forced to conclude either that Descartes wrote one of them first (and used it as a model for writing the other) or that Descartes first came up with the general scheme and wrote both sections with reference to it. For reasons that are reasonably strong, Weber concludes that Descartes wrote IV-B first and then used it as a model for composing IV-A.⁶⁶

When Weber discusses this later in the chapter, what he says seems to work against, rather than to support, his main argument; for there Weber explains the structural analogy between IV-A and IV-B by granting that 'The universal Methodus of IV-A transposes, incontestably, the project of *Mathesis universalis* on a level of superior generality'.⁶⁷ But if indeed this is 'incontestable' (and I would agree that it is), then there is no good reason to conclude, as Weber then does, that the more general method annuls the more particular. As Weber puts it, we are forced to conclude, on these grounds alone, that IV-B is an out-of-date sketch of IV-A. This simply does not follow from the mere fact that IV-A is more general than IV-B; for a person may very well generalize a particular finding and not annul its content.

⁶⁴Ibid., 4.

⁶⁵Ibid., 4.

⁶⁶Ibid., 15.

⁶⁷Ibid., 15.

Weber's fourth claim is that 'no text in the *Regulae* takes up or recalls the analyses of IV-B', and that following its composition the notion of *mathesis universalis* 'sinks into a total oblivion'.⁶⁸ But this claim is simply false. In IV-B, Descartes writes:

I realized that all and only those things are referred to mathematics, in which some order or measure is examined, and that it matters not whether the measure sought be in numbers, or figures, or stars, or sounds, or any other object whatsoever; and thus that there ought to be a general science, which would explain everything that can be sought with regard to order and measure not bound to any special matter, and that it should be called, not by a far-fetched term, but by a venerable one with a well-established meaning, *mathesis universalis*, since in it everything is contained, on account of which these other sciences are also called parts of mathematics.

(AT X, 378)

A number of insights are packed into these few lines; one of them is that 'it doesn't matter whether the measure sought be in numbers or figures ...'. This claim clearly refers to the division within Euclidean mathematics between arithmetic (the study of discrete multitudes) and geometry (the study of continuous magnitudes). Descartes refers to this distinction again in Rule XIV (AT X, 450) and suggests there the basis for it – namely, the impossibility, in general, of finding a common unit in terms of which all continuous magnitudes can be measured. Furthermore, in Rule XVI we find the rule that 'a given magnitude, even though it is called a cube or the square of the square, should never be represented in the imagination otherwise than as a line ...' (456). This suggests Descartes' novel interpretation of multiplication (introduced in the first few pages of the *Geometry*), according to which multiplying one line segment by another always produces another line segment. This is the key that allows Descartes to apply algebraic problem-solving strategies to problems in geometry and thus to exploit the analogy between arithmetic and geometry to great success. It is clear then: far from sinking into oblivion, *mathesis universalis* as defined in Rule IV-B provides the basis for Book II of the *Regulae*.⁶⁹

Proceeding as he does on the level of disconnected fragments, Weber never even mentions these later developments. His claim is false also with

⁶⁸Ibid., 5.

⁶⁹The second part the key phrase reads, '... it does not matter whether the measure sought be ... in stars or sounds or any other object whatsoever'. This indicates the subject matter of the projected Book III of the *Regulae* – that is, disciplines, such as astronomy, music theory and optics, which Aristotle considered 'subordinate' mathematical disciplines.

regard to the (numerically) earlier Rules.⁷⁰ Having indicated the power of *mathesis universalis*, in IV-B Descartes goes on to ask why

most people painstakingly pursue the other disciplines which depend on it, and no one bothers to learn this one? No doubt I would find this surprising [Descartes continues] if I did not know that everyone thinks the subject too easy, and if I had not long since observed that the human intellect always bypasses subjects which it thinks it can easily master and directly hurries on to new and grander things.

(AT X, 378)

In Rule II we already find the same general theme: 'owing to a common human failing, [men of learning] have disdained to reflect upon ... indubitable truths, taking them to be too easy and obvious to everyone' (362). These comments may seem like off-hand sociological observations which are at best tangential to the substance of Descartes' argument. But the 'failing' [*vitium*] Descartes brings to our attention in these passages is in fact, according to Rule I, the main reason the human mind stands in need of direction; in other words, this vice is the primary target of the Rules. For in Rule I Descartes claims that 'what makes us stray from the correct way of seeking the truth is chiefly our ignoring the general end of universal wisdom and directing our studies towards some particular ends' (360). More precisely, according to Descartes in Rule I, we frequently 'overlook many items which are required for a knowledge of other things, because at first glance they seem of little use or of little interest [*multa ... vel quia parum utilia, vel quia parum curiosa videbuntur, omittamus*]' (361). The particular ends which tend to mislead us, then, are utility and curiosity.

Thus the main purpose of Rule I is to prevent us from overlooking things that on first glance seem neither interesting nor useful, but which nonetheless are essential to 'universal wisdom' (that is, our ability to deal effectively with any given problem).⁷¹ What apparently useless and uninteresting things was Descartes worried we might neglect? The best candidates are precisely the things which, as Descartes observes in IV-B, many clever men 'quickly lay aside as childish and pointless [*ut pueriles et vanas*]' (AT X, 375) – namely, arithmetic and geometry. On this reading,

⁷⁰Inspired by Weber, Schuster also claims that Rule IV-B (on *mathesis universalis*) has 'no echoes elsewhere in the early text' (Schuster, *Descartes*, 177).

⁷¹At the end of Rule I, Descartes recommends that the student should consider 'how to increase the natural light of his reason, not with a view to solving this or that scholastic problem, but in order that his intellect should show his will what decision it ought to make in each of life's contingencies' (AT X, 361). By using the phrase 'each of life's contingencies', Descartes apparently wants his method to cover virtually every situation we encounter; but generally he has in mind something much more specific. For example, in Rule III, he says that '... even though we know other people's demonstrations by heart, we shall never become mathematicians if we lack the intellectual aptitude to solve any given problem' (367).

Rule I – the most obviously universalist of all the Rules – is already preparing the way for the *mathesis universalis* of IV-B. For as taken up and methodically transformed into *mathesis universalis*, and then applied to the study of nature, the apparently empty games of arithmetic and geometry will be shown to be capable of yielding fascinating and powerful results. When we look at the Rules in this light, Weber's claim that IV-B is obviously insular looks completely arbitrary.⁷²

In order to make my case, I have selected and brought together three different passages – one from Rule I, one from Rule II, and one from IV-B – because they seemed to treat a common theme: the human mind's unfortunate tendency to overlook important things that at first glance seem neither interesting nor useful. I then inferred that Descartes probably had something similar in mind in each case, and compared them to see what light they might shed on each other. Customarily, such an interpretive strategy would not merit any special attention; but Weber does not use this unremarkable strategy – and *that* is remarkable! Indeed, he seems to have forbidden himself to use such strategies.⁷³ Presumably, he thinks it would be inappropriate to use them if in fact the text of the *Regulae* is a stitched-together collection of fragments. This is precisely the question at issue. Thus the patchwork theory is viciously self-confirming.⁷⁴

Let us follow Weber's argument to the end. He grants that the four points reviewed above only make his thesis probable; but, taken together with the fact that, in version **H**, IV-B is included only as an appendix, he thinks they prove it.⁷⁵ But why should we prefer **H** to the other versions? Weber says 'it is evident that no copyist ... would have taken the truly audacious initiative ... of thus dividing up a chapter of the original which he had before him'. Weber continues, it *is* understandable that the editors of **A** might have taken a special interest in the appendix (IV-B); thus we *can* explain why *they* included it in the body of Rule IV.⁷⁶ According to Weber the only plausible way to account for the difference between **A** and **H** is to suppose that Descartes himself included IV-B as an appendix. If so, Weber's conclusion would – supposedly – follow: IV-B is an out-of-date draft which does not belong to the definitive text of Rule IV and indeed is alien to it.⁷⁷

Weber formulated his thesis without referring to **N** and before Crapulli issued his critical edition of the *Regulae*. **N**, like **A**, also includes IV-B in the body of Rule IV, and Crapulli suggests a plausible alternative to Weber's hypothesis. According to Crapulli, the displacement of IV-B in **H** is

⁷²Weber, *Constitution*, 5.

⁷³Weber claims that 'it is necessary to read the *Regulae* ... by seeking, before commenting on an idea, to know to what strand it belongs ... And it is only after [completing] this genetic analysis that we have the right to propose any synthesis ...' (ibid., 2).

⁷⁴Cf. n.9 above; also Marion, *Ontologie*, 17.

⁷⁵Weber, *Constitution*, 4.

⁷⁶Ibid., 6.

⁷⁷Ibid., 7.

'probably due to the autobiographical character of the passage, which interrupts the development'.⁷⁸ As I suggested above, someone who reads IV-B without understanding its connection to IV-A might not understand the role it plays as an example of *something* more general.

What exactly *is* the relationship between the subject matter of IV-A and that of IV-B? Following Weber, let us review the options. Weber first considers the possibility that *mathesis universalis* is identical with the universal method discussed in IV-A and – in my view, correctly – rejects it for the following reason.⁷⁹ According to IV-A, the discipline Descartes is expounding (presumably, his method) 'should contain the primary rudiments of human reason and extend to the discovery of truths in any field whatever' (AT X, 374). According to IV-B, *mathesis universalis* is universal only in the sense that it 'explains all the points that can be raised concerning order and measure irrespective of the subject matter ...' (378). As a tool for studying quantifiable aspects of nature, *mathesis universalis* clearly has a wide scope, but does *not* extend to 'truths in any field whatever'; most obviously, it does not extend to truths regarding spiritual entities such as God and the soul, so the universal method of IV-A is more universal than the *mathesis universalis* of IV-B and is not identical to it.

The second option is that *mathesis universalis* is a particular application of the universal method discussed in IV-A. According to Weber, to say that *mathesis universalis* is a particular application of the method is to claim that Descartes first developed the general method, reflected on it, and then applied it to the field of traditional mathematics.⁸⁰ In IV-B there is no indication that Descartes followed such a procedure; indeed, as Weber has pointed out, the term 'method' does not occur in IV-B at all.

It is not necessary to suppose that Descartes' method is a tool that must first be constructed before it can be applied to a domain of inquiry. Indeed, in Rule X, Descartes tells a very different kind of story. For there (in another apparently autobiographical passage) Descartes writes:

Whenever the title of a book gave promise of a new discovery, before I read any further I would try and see whether perhaps I could achieve a similar result by means of a certain innate sagacity ... So frequently was I successful in this that eventually I came to realize that ... after many trials I had hit upon some reliable rules of great assistance in finding the truth, and I then used these to devise many more. In this way I carefully elaborated my whole method.

(AT X, 403–4).

According to this story, Descartes developed his method by reflecting on his own successes and failures in tackling a variety of problems. If so, we can

⁷⁸*Regulae*, edited by Crapulli, 86.

⁷⁹Weber, *Constitution*, 7–8.

⁸⁰*Ibid.*, 8.

say that Descartes did not – and could not – ‘have’ his method until it had already succeeded. As a matter of fact, from the beginning of his association with Isaac Beeckman at the end of 1618, and throughout the period of the *Regulae*, Descartes devoted himself to quantitative problems in natural science and to the mathematics that such a study of nature might require. We can say *both* that *mathesis universalis* was the first fruit of Descartes’ method *and* that he developed his method in the process of working out his *mathesis*. For according to the story Descartes himself tells us, the rules of his method arose as fruits of reflection in the course of his active engagement in particular investigations of just this sort. We can now see that Weber rejects the second option only because he takes for granted an unnecessarily rigid notion of what it might mean to ‘have’ and to ‘apply’ a method. We need not follow him in this respect and so *can* maintain that (in a certain sense) *mathesis universalis* is a particular application of the method discussed in IV-A.

We can also affirm Weber’s third option and maintain that *mathesis universalis* is also – again, in a certain sense – propaedeutic to the universal method discussed in IV-A.⁸¹ We have just seen that Descartes himself seems to have developed his method by reflecting on his successes and failures in areas of inquiry that fall under *mathesis universalis*. I have also suggested that, in order to understand the logic of Descartes’ method in the *Regulae*, we have to begin by working through examples that illustrate how it operates when applied to corporeal nature. Therefore, *mathesis universalis* is propaedeutic to Descartes’ method – both for us and for Descartes himself.

Weber rejects this third option mainly on the basis of his reading of the final paragraph of IV-B, in which Descartes writes:

I have resolved in my search for knowledge of things to adhere unswervingly to a definite order, always starting with the simplest and easiest things and never going beyond them till there seems to be nothing further which is worth achieving where they are concerned. Up to now, therefore, I have devoted all my energies to this universal mathematics, so that I think I shall be able in due course to tackle the somewhat more advanced sciences, without my efforts being premature. But before I move on, [let me record in this book the results of my studies so far].

(AT X, 379).

According to Weber, this passage signifies that Descartes was ‘on the verge of ‘distancing’ himself from universal mathematics in order to turn towards ‘somewhat more elevated sciences’.⁸² Much depends on precisely what Descartes had in mind in speaking of *paulo altiores scientias*. Weber argues that Descartes cannot have meant sciences such as optics and mechanics

⁸¹Weber, *Constitution*, 9–10.

⁸²*Ibid.*, 10.

since he refers to them as 'subordinate to' [*subditae*] and dependent on *mathesis universalis* (378); presumably, what is subordinate to something cannot also be 'higher' than it.

There are at least two options here. First, as defined initially, *mathesis universalis* is purely mathematical: 'it explains all the points that can be raised concerning order and measure irrespective of the subject matter ...' (AT X, 378). Furthermore, the particular 'branches' [*partes*] of it, such as optics, are said to involve difficulties, due to their particular objects, which *mathesis universalis* does not. We may suppose that when Descartes claims to be following an order, beginning with the easiest things and only later proceeding to 'higher' (or 'deeper') things, that he is talking about a move from pure mathematics to its applications in physical science.⁸³ In any case, we should bear in mind that it is no straightforward matter to 'apply' mathematics to the study of nature. Most obviously, one has to decide what aspects of phenomena are relevant to the problem at hand and then figure out how to measure them experimentally. A particular mathematical discipline such as optics is not 'subordinate' to (pure) mathematics in the sense that all its principles are handed down to it, so to speak, from on high.

Since, according to Descartes, a science such as optics *can* be considered a branch or part of mathematics, there is a second option: perhaps when Descartes speaks of moving on from 'this universal *mathesis*' to higher sciences he is, as Weber suggests, talking about a move from the mathematical study of nature to 'Philosophy' (that is, presumably, First Philosophy).⁸⁴ Weber adds: '*from the moment one turns toward Philosophy, one must withdraw from and distance oneself from universal mathematics*. The latter is not a progress towards more important applications of the method, and is not a "propaedeutic" to the method'.⁸⁵

One might think Weber is simply reading too much into the last phrase of the passage quoted above: *priusquam hinc migrem* (literally, 'before I depart from here').⁸⁶ Something deeper is involved – namely, Weber seems to think that the universal method discussed in IV-A is primarily or even exclusively a method of 'philosophizing' – and not in the broad sense (which would

⁸³Note that *altus* may mean either 'high' or 'deep' – for example, as applied to water.

⁸⁴In an arguably parallel passage in *Discourse on the Method*, Descartes writes:

I hoped to apply [the method] as usefully to the problems of other sciences as I had to those of algebra ... But observing that the principles of these sciences must all be derived from philosophy, in which I had not yet discovered any certain ones, I thought that first of all I ought to establish some certain principles in philosophy.

(AT VI, 21–2)

Here it seems quite clear that the 'other sciences' to which he hopes to move on are the physical sciences. At this later date he foresees the necessity of a detour into metaphysics; there is no hint that he saw anything of the sort in the *Regulae*.

⁸⁵Weber, *Constitution*, 10.

⁸⁶An obvious possibility, which Weber fails to consider, is that when Descartes writes, 'Before I depart from here ...' he means 'Before I depart from the *Regulae* as a whole' – not from Rule IV-B!

include natural philosophy) but in the narrow sense of elaborating a First Philosophy. If so, Weber wants not simply to leave behind the ‘early draft’ he sees in IV-B for the (chronologically) later Rules, but to leave behind the *Regulae* altogether for the *Meditations*.

For the passage from Rule VIII in which Descartes discusses the plan of the work is certainly ‘later’ in the sense that when he composes it Descartes already has a more or less clear view of the *Regulae* as a whole. In this passage the distinction between spiritual and corporeal natures plays an indispensable role; and given this distinction, Descartes’ method in the *Regulae* can be ‘universal’ only in an equivocal sense; that is, it can be universal only insofar as it remains general or makes no reference to a particular subject matter; it cannot be universal in the way that First Philosophy, for Aristotle, is ‘universal because first’ (i.e. because it studies the principles or sources of everything else).⁸⁷

This can be established as follows. If Descartes has a universal method in the *Regulae*, it applies both to intellectual and to material natures. But according to Rule XII, ‘If the intellect proposes to examine something which can be referred to body, the idea of that thing must be formed as distinctly as possible in the imagination’ (AT X, 416–17); this principle leads to the representational strategies to be employed in Books II and III. In contrast, if the intellect ‘is concerned with matters in which there is nothing corporeal or similar to the corporeal, it cannot receive any help from [the senses or the imagination]’ (ibid.); but then all these two domains of inquiry have in common are the general notions of simple and composite natures, and the logical operations of intuition and deduction which begin with the former and lead to the latter. We may present these two domains of inquiry and the general notions that connect them (i.e. apply to both), as follows:

Reduction to and intuition of simples

Deduction of composites

Spiritual natures

Corporeal natures

Direct intellection:

Imaginative representations:

⁸⁷Aristotle writes in *Metaphysics* Book VI (E),
if there were no substances other than those formed by nature, physics would be the first science; but if there is an immovable substance, this would be prior, and the science of it would be first philosophy and would be universal ... in view of the fact that it is first.

(1026a 28–32)

Marion quotes and comments on this passage in Section 11 of *L’Ontologie grise* (64–9).

- | | |
|---|--|
| <p>'I am, therefore God exists ...'</p>
<p>'I understand, therefore I have
a mind distinct from my body.'⁸⁸</p> | <p>– The figures and symbols
of algebraic geometry</p>
<p>– Application to the study of
nature in optics, harmony, etc.</p> |
|---|--|

Therefore, an act of intuition is either an act that 'reaches' a corporeal simple nature or an act that reaches a spiritual simple nature.⁸⁹ There is no indication in the *Regulae* that there might be an object of knowledge that could serve as a common root or source for true judgements both with regard to spiritual and with regard to corporeal natures. As stated above, the *Regulae* expounds a universal method only in the sense that many of the rules in it make reference to no particular class of objects and instead are concerned with the general nature of those acts of the mind which according to Descartes are involved in any *scientia* whatsoever.

Therefore, there is no conflict between the passages in which Descartes suggests that he has a universal method and those in which he suggests that any investigation of corporeal nature will fall under *mathesis universalis*. There is also no reason to suppose that Descartes reached a stage in the composition of the *Regulae* in which he realized that the universal method he wanted was incompatible with *mathesis universalis* or that moving on to the former would require the annulment of the latter.⁹⁰

Weber's interpretation collapses and mine remains to be tested.⁹¹

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⁸⁸See Rule XII, AT X, 422.

⁸⁹In Rule VIII, Descartes says that 'things themselves ... are to be regarded [in this context] only as they are reached [*attinguntur*] by the intellect ...' (AT X, 399).

⁹⁰Cf. Weber, *Constitution*, 11.

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