

4-7-2017

Cartesian Method and Experiment

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Cartesian Method and Experiment

by

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A dissertation submitted in partial fulfillment
of the requirement for the degree of
Doctor of Philosophy
Department of Philosophy
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Date of Approval:
3 April 2017

Keywords: Early Modern Philosophy, Cartesianism, Astrology, History of Ethics,
Rohault, Gadroys

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LIST OF ABBREVIATIONS

- AT Descartes, René. *Œuvres de Descartes*. Edited by Charles Adam and Paul Tannery. Paris, 1910.
- CSM Descartes, René. *The Philosophical Writings of Descartes: Volumes I-II*. Translated by John Cottingham, Robert Stoothoff, and Dugald Murdoch. New York, NY: Cambridge University Press, 2007-2009.
- CSMK Descartes, René. *The Philosophical Writings of Descartes: Volume III, The Correspondence*. Translated by John Cottingham, Robert Stoothoff, Dugald Murdoch, and Anthony Kenny. New York, NY: Cambridge University Press, 1999.

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ABSTRACT

The conception of René Descartes as the arch-rationalist has been sufficiently exploded in recent literature; however, there is still a large lacuna in our understanding of how empirical research and experimentation fits within his philosophy. My dissertation is directed at addressing just this problem. I contend that Descartes' famed method is not a singular monolith but instead two interdependent methods: one directed at metaphysical and epistemological truth, while the other directed at empirical questions and contingent facts of the world. I claim there is evidence for this position not only in his actual scientific practice, but also in the rhetorical structure of the *Discourse on Method* and the *Principles of Philosophy*. In exploring the empirical side of Descartes' method, I show how his unusual system produces a system of experiment designed to serve both as a discovery and verification tool at the same time.

As a further application of my interpretation, I argue that the *Passions of the Soul* and Descartes' ethical theory expressed in his correspondence must also be seen as part of his two-fold methodology. Instead of attempting to cast Descartes as a virtue ethicist or deontologist, as is normally done, I emphasize that Descartes' ethics is centered on the mind-body union, and therefore, includes an empirical element as well. The end result is an ethics that requires a detailed study of mechanics, anatomy, physics, as well as medicine.

Lastly, I show how this methodology can help us understand the works of some of his early followers: Claude Gadroys and Jacques Rohault. Both of these philosophers not only serve to ground my interpretation, but also to highlight aspects of Cartesian that have often been passed over. I show how the experimentalism of Jacques Rohault goes beyond the epistemological boundaries set up by Descartes, as signifies a new direction that will ultimately eclipse the Cartesian school of thought. In the case of Claude Gadroys, I present a concrete example of the exploitation of the over generality of Cartesian principles. In so doing, I show that while Descartes' experimentalism was intended to rule out the possibility of occult causes, he in fact created a system that allowed for them, only under a different guise.

CHAPTER ONE:

THE TWO METHODS OF THE *DISCOURSE ON METHOD*

The *Discourse on Method*, first published in 1637 and accompanied by three essays: the *Dioptrics*, *Meteors*, and *Geometry*, propelled Descartes to the center of philosophical and scientific communities of his day. The importance of these documents to understanding Descartes' overarching project cannot be overstated. However, what Descartes actual method is, despite the title of the work, is a surprisingly contentious subject of debate. To untangle the puzzle the *Discourse* and its *Essays* presents regarding Descartes' method, I first propose to look at the historical context surrounding these documents with the idea that this context will shed some light on Descartes' original intentions for the project. Later, I will look to the *Essays* themselves to see how much of his famed method can actually be distilled from the mash of observations, experiments, and philosophy that comprises the three essays. Ultimately, my goal is to show that in the *Discourse* Descartes adopts two distinct methods, conceived as methods to discover every truth about nature and ourselves, and that once these two methods are exposed we will be able to see how they are connected to the *Essays* as well as Descartes' later work.¹

¹ Daniel Garber (2001), however, claims that Descartes abandons his method rather early on. As we will see, there is not enough evidence for this position, and even Garber has since moved away from the claim. Clarke (2006, p. 90) also believes that Descartes had broadly abandoned any serious commitment to a method after the *Rules*.

I. A Brief Note on Methodology

John Schuster rightly points out that there is an inherent problem in discussing Descartes' method from our contemporary perspective.² On the one hand, given the work of Kuhn, Koyré, Feyerabend, and the like, there seems to be a justified skepticism regarding the efficacy of method and whether it can truly guide practice. However, on the other hand, many scholars, along with Descartes' early followers, took the Cartesian claim to a universal method as genuine—that is to say, they understood it as a method that in fact directly led to some of Descartes' greatest discoveries. From all outward signs, Descartes' himself seemed to very much believe in the efficacy of his own method, which should come as no surprise. Swayed by Descartes' own rhetoric, many scholars have attempted to explain exactly how Descartes' method did in fact result in specific practice and discoveries of everything from the anaclastic line to the *Meditations on First Philosophy*.³ Schuster's question then is how could so many people have believed and attempted to follow something that could not possibly have worked in actual scientific practice? His solution is to consider Descartes' claims regarding his method as nothing more than literary devices—“mythic speech,” as Schuster puts it. This point is well taken. It seems silly to try to retrace Descartes' steps in any of his discoveries by recreating his method. However, his (and his followers') belief in the method is not something that can be readily discarded without doing a serious disservice to the history of philosophy. Thus, as a compromise, while it would be a fool's errand to extrapolate how the method actually resulted in the great claims made by Descartes, we can nevertheless consider his method as a mode of presentation. As a mode of presentation

² Schuster (1983, p. 33-40) and again in (1993).

³ See Garber (2001, p. 36-37), and Flage and Bonnen (1999) respectively.

we can see how Descartes allowed his conception of method to unfold throughout his texts and how the structure of them is meant to mirror what he claims to be his method. At the same time, we avoid taking the overly simplistic method explicitly formulated by Descartes as actually exclusively dictating his practice, where the alternative would miss out on the massive amounts of complexity and ingenuity that do not neatly fall within the restrictive bounds of his method.

In treating Descartes' method as merely a mode of presentation, even though he believed it to be a method of discovery, we can, as it were, have our cake and eat it too. We can account for Descartes' sincere belief in the efficacy of his method and explain behavior based on this belief (i.e. the structure of his works, his writing style, etc.). Further, it helps emphasize that while his ideas are supposed to result from the method, they actually do not, which will also help explain some interpretive problems that will be discussed later on. Indeed, there has been a general tendency to force every Cartesian discovery into the mold presented either in the rules of the *Rules for the Direction of the Mind* or the four rules of part II of the *Discourse on Method*. My position is that such readings can certainly be given for any Cartesian argument or discovery, but this should not be seen as confirmation of that reading. The basic problem is that either the richness of scientific practice very quickly exceeds the bounds placed upon it by any method, and we are left trying to shoehorn in an oversized engine into an economy car, or we interpret the method in such a general manner that it can account for any practice at all. In either case, overly emphasizing a method as an explanatory tool will fall short—in the first case, because it is being over extended to apply to areas where it should not, and in the second, because it becomes unfalsifiable, and thus lacks real content. That being said, Descartes' method is no exception, and I believe no scholar would deny that,

whatever is taken to be Descartes' method, it has no shortage of vagueness—indeed, this goes a long way toward reinforcing Schuster point. Where Schuster and I disagree is on the core of Descartes' "method discourse"⁴ and how it connects to his later works, all of which will come to the fore later on in the essay. To begin, we should examine some of the history behind the *Discourse* to first pin down exactly how and why he chose to frame his method in the way that he did, and how grasping this particular strategy can help us further understand subsequent works.

II. The Genesis of the *Discourse*

The *Discourse*, as a historical text, is incredibly rich. For one, it is tied in with the development of Descartes' thought; as such, it bears relation to both one of his earliest philosophic works, the *Rules for the Direction of the Mind*, and his most important later works, the *Meditations* and the *Principles*. In this way we can see the *Discourse* as an intermediary work, which serves as a bridge to connect the early period of Descartes work to the later. Secondly, the *Discourse* and the three essays published with it also represent a formative moment in Descartes' publishing and rhetorical strategies. As is well known, upon learning the misfortune that befell Galileo after publishing his own works, Descartes made what he believed to be the prudent decision and self-censored one of his earliest and most ambitious projects, the *World*.⁵ Unsatisfied with idleness brought about from his self-imposed prohibition on publishing, and pressured by his

⁴ Schuster believes that the core of Descartes method is to be found through an analysis of the *Rules* and part II of the *Discourse on Method* (Shuster, 1986, p. 40-47) and again in (1993, p. 200-201).

⁵ Descartes discusses his fear of Galileo's plight in a series of letters to Mersenne dated, November 1633 (AT, I: 269), February 1634? (AT, I: 285), and May 1634 (AT, I: 287). It is quite interesting that in the last of these letters Descartes explicitly address how even the hypothetical nature of Galileo's work could not save him from condemnation. He further asks for clarification on Galileo's situation in letters to Mersenne dated 15 May 1634 (AT, I: 292), and 14 August 1634 (AT, I: 303).

ideas circulating in a diluted or corrupted form,⁶ he creates the *Discourse* as a way to reveal his ideas to the world while, at the same time, insuring his safety and leisure in his cherished “desert.”⁷ Keeping in mind Descartes’ prudence, it is just as important to take into account what is in the work as well as what is left out. As I will show later on, Descartes intentionally leaves out parts of his method, which in turn has led to many interpretive problems.

Even the publication history of the *Discourse* is rich. Through Descartes’ correspondence an incredibly detailed picture of the hurdles he faced in publishing comes to light: finding a publishing house, securing the royal permission to publish, and even hiring a suitable artisan to create the illustrations are all discussed in varying levels of detail throughout the early correspondence.

It is important to note that, as well as serving to disseminate Descartes’ thought, the *Discourse* served an important role for Descartes’ own self-promotion and the seemingly timeless search for patronage. Paradoxically, however, running directly contrary to this purpose is Descartes’ indefatigable intention to remain anonymous. While engaged in the lengthy process of acquiring a royal license to publish from France, which would secure the work against counterfeiters, problems arose due to his unwillingness to be publically associated with the work.⁸ However, much to Descartes’ chagrin, Mersenne openly divulged his name and allows it to appear in an early version of the royal license, which would have been appended at the end of the book.⁹ Eventually, Descartes’ protestations gained traction and the first edition of the

⁶ At least this is how Descartes portrays the situation in part VI of the *Discourse*.

⁷ Descartes often referred to his home in the Netherlands as a desert to highlight the solitude and lack of distractions compared to Paris.

⁸ Descartes to Huygens, 3 March 1637 (AT, I: 622).

⁹ AT, I: 396.

Discourse only mentions “the author” but nowhere the author’s name. Despite all this, he was fairly insistent to ensure, with no apparent attention to keeping his solitude, that the *Discourse* found its way into the hands of more than a few important figures.¹⁰ In this vein, as a tool for the promotion and promulgation of his work, the *Discourse* served a twofold purpose. First, Descartes planned to collect objections to the *Discourse* and its three essays and publish responses publically—thus, the initial publication of the *Discourse* and *Essays* was only to be a first step toward a complete work.¹¹ Second, Descartes saw the work as paving the way for his more ambitious treatise *The World*, insofar as he hoped it would drum up sufficient demand for his works to assuage his fear of persecution or censure.¹² The *Discourse* must be seen as a bellwether, as it is only intended to reveal enough of Descartes’ views to entice the reader to demand more. In this regard, if his hopeful view turned out to be misguided, Descartes’ strong insistence on anonymity would certainly have proved invaluable.

However, even given this brief snapshot of the nuanced context that helps situate and anchor this unique document, along with Descartes’ intentions, it still poses itself, philosophically, as a cryptic jigsaw puzzle of seemingly unrelated parts. Perhaps the most important interpretative difficulty is found in the murky relationship of the *Discourse* itself with the three essays that accompany it: the *Dioptrics*, *Meteors*, and *Geometry*. Like most of Descartes’ works, the *Discourse* and *Essays* were not completed

¹⁰ Descartes initially wanted to be given at least 200 copies from the publisher for him to distribute to whom he saw fit (Letter to Mersenne, March 1637 (AT, I: 339)). The recipients of the discourse are wide ranging from the Stadholder, Frederik-Hendrik, to the wives of Constantijn Huygens and David le Leu de Wilhem.

¹¹ This plan, of course, does not go nearly as smoothly as Descartes had hoped. Many authors who write in refuse to agree to allow their objections to be published, while others are criticized by Descartes for lacking in quality. Surely this experience led to the more managed approach taken to the objections and replies of the *Meditations*.

¹² Letter to Cerizy(?), May 1637 (AT, I: 369).

in one sitting, but were worked on in fragments, taken up and set down at various times, and pieced together at the very last moment. I will show that understanding the stages of the development of the *Discourse* and *Essays* is one of the most important clues to understanding the method that is supposed to be revealed therein.

When we begin to look at the composition of the *Discourse* apart from its *Essays*, it quickly becomes obvious that it was not as prominently featured in Descartes' plans as it has been in the historical reception of it. Indeed, as is revealed in his correspondence, the *Discourse* itself seems to have been merely an afterthought. Through the correspondence we can track much of Descartes' work on the *Essays* well before any mention of the *Discourse* itself. In a letter from the summer of 1635, we learn that Descartes has separated the *Dioptrics* from the *World* and he plans to publish it as a standalone treatise.¹³ Shortly thereafter, still in 1635, Descartes announces his plans to attach *Meteors* to the *Dioptrics* and first mentions a preface planned to be attached to the two works—it is commonly held that this preface will eventually become the *Discourse*.¹⁴ In March of 1637 Descartes writes to Mersenne to tell him that the *Discourse*, no longer merely a preface, and the *Geometry*, which he was still working on through 1637,¹⁵ will now be included, which brings us to the final four treatises we know today.¹⁶ However, when Descartes sends his works to be reviewed for consideration for a Royal license to publish, he sends only the three essays and not the *Discourse* itself;

¹³ Descartes to Mersenne (AT, I: 322).

¹⁴ Descartes to Huygens, 1 November 1635 (AT, I: 591). We can pinpoint the exact starting point of the *Meteors* to be the 5th of February, from a letter he wrote to Chanut on March 6th 1646 (AT IV, 376).

¹⁵ In a letter to an unknown correspondent Descartes says of his *Geometry*, "It is a treatise that I partially wrote while my *Meteors* was being printed, and I even came up with a section during this time" (AT, I: 458, my translation)

¹⁶ AT, I: 339.

whether it is because the work is not yet finished or Descartes did not deem it important enough to send is unclear.¹⁷

In the constant flux of additions and changes, even the title of the *Discourse* experienced its own unique genesis and offers an interesting insight into Descartes' thoughts on the role of the text in relation to the three essays. The first mention of a possible title comes in March of 1636 as *The Project of a Universal Science that can Elevate our Nature to its Highest Degree of Perfection*. The *Dioptrics*, *Meteors*, and *Geometry* also have a subtitle attached to them that claimed each to be a work *in which the most curious Matters that the Author could have chosen to serve as proof of the universal Science he proposes are explained in such a way that even those that have never studied can understand them*.¹⁸ Later in a letter to Huygens, who suggests a change to the current title of the *Discourse*, Descartes adamantly defends his choice of the word 'discourse': "I said '*Discourse on Method*', instead of putting simply, '*Dioptrics*' and '*Meteors*', because I undertook to include there everything that regarded my subject."¹⁹ The title of the work becomes a sticking point for Descartes, who had already defended it once to Mersenne:

But I did not know how to understand very well your objection regarding the title as I did not use *Treatise on Method* but instead *Discourse on Method*, which is the same as *Preface or Notice concerning Method*, to show that I had no plan to teach the method but only to discuss it. As one can see from what I say in it, it consists more in practice than in theory, and I name the following treatises *Essays in this Method* because I claim the things they contain could not be

¹⁷ Mersenne to Descartes, 15 February 1636 (AT, I: 659).

¹⁸ AT, I: 339.

¹⁹ 27 February 1637 (AT, I: 620).

discovered without the method, and that one can know its value through them. I have also inserted some things of metaphysics, physics, and medicine in the first discourse to show that the method extends to all kinds of subjects.²⁰

The main point is thus that the *Discourse* should not be interpreted as giving a completely rigorous system of demonstration or discovery, and that the title itself must reflect this.²¹ Taking Descartes at his word on this point, as we have no textual evidence that he ever claimed to have fully explicated his method or changed it, we must take seriously the limitations placed on discussing his method as presented in the *Discourse*. At the very most, we can only hope to find bits and pieces of it played out through examples and not compactly located in any one place. I would also like to note in the above passage, as we will be returning to it later, the emphasis placed here on *practice* above theory in the presentation of the method.

III. The Method of the *Essays*

Just how we should view the *Discourse* given the three essays that accompany it, and how, if at all, is the famed method proposed therein aligned with the essays? My own methodological claim is that given the historical circumstance outlined above, it seems reasonable to view the *Discourse* in light of the essays and not vice versa, as has commonly been done. One good reason for taking this position is that the *Discourse*, as Descartes himself had said, reveals only part of the method that is to be demonstrated in the essays, whereas the *Essays* are explained as exercises in that method. This, of course, presents a severe limitation on any possible interpretation of that method taking

²⁰ April 1637 (AT, I: 348).

²¹ Descartes again notes that he is only giving part of his actual method in a letter to Mersenne dated March 1636 (AT, I: 338), and he repeats this again in a Letter to Vatier(?) (AT I, 559).

mostly from the *Discourse* alone. Descartes even goes so far as to mention that the *Discourse* is "the least well-developed of the entire work."²² Further, the fact that the *Discourse* itself was written well after much of the work for both the *Dioptrics* and *Meteors* was completed again gives us some cause to believe that he wrote the *Discourse* to align with the essays and not the other way around. To expound upon this point, I propose looking first at the *Discourse* and then trying to find a connection to the essays. Then, in a very Cartesian fashion, I intend to reverse my analysis and move back from the essays to the *Discourse*, hoping that the fundamental questions surrounding the *Discourse* (e.g., what parts of Descartes' method are missing, and how the *Discourse* is supposed to relate to the *Essays*) will be clarified in the process.

As I have already mentioned, there is considerable scholarly disagreement about what Descartes' method is, so it is no wonder that there has been some difficulty tracking the method through the *Essays*. The received view seems to be that when looking for Descartes' famed method we should look primarily in part II of the *Discourse* where he gives four general rules for his method.²³ The first rule tells us to never accept anything as true that is not completely evident. The second is to divide problems into their simplest parts. The third is to order one's thoughts by the simplest and easiest to understand and to move little by little to the more complex. And finally, the last maxim is to make lists and summaries to make sure that nothing has been omitted regarding the problem at hand.²⁴ *Prima facie*, there is good cause to believe that this vague and relatively terse set of prescriptions is the real meat of Descartes'

²² However, he does also claim that it is the most important (AT, I: 560).

²³ For a paradigmatic example of this see Daniel Garber's essay, "Descartes and Method in 1637" in *Descartes Embodied: Reading Cartesian Philosophy Through Cartesian Science*.

²⁴ AT, VI: 18-19.

methodology—part II is, after all, introduced by Descartes himself as, where we can find "the principal rules of the Method the Author had searched for."²⁵ Apart from this most obvious bit of information, many commentators have sought to find evidence for establishing part II of the *Discourse* as Descartes' method by tracing a line of continuity between it and his earlier work, the *Rules*.²⁶

The *Rules* went about establishing a set of rules that, when followed, would lead the mind toward new truths—a project very similar in tone to the full title of the *Discourse*. I take this, along with some similarities between specific rules in the two texts, to be the primary motivating force for looking toward the *Rules* to elucidate the method of the *Discourse*. For example, rules two and three in the *Rules*, which demand certain cognition, seem to correspond loosely to the first rule of the *Discourse*. Similarly, rules five and six, which deal with order and simplicity, broadly correspond to rules two and three of the *Discourse*.²⁷ There are, however, significant differences between the two texts, which makes the connection a bit more difficult to discern. Most obviously, the *Rules* was originally intended to be comprised of three sets of twelve rules, of which only twenty-one rules were completed—none of which were ever published during Descartes' lifetime.²⁸ If we are to find some constancy among these rules, we have to admit that Descartes had reconsidered the majority. By the time of the *Discourse*, he had shrunk his set of rules to a meager four painfully vague rules lacking in anything close to the

²⁵ AT, VI: 1.

²⁶ See Beck (1952), Brissey (2013), Bonnen and Flage (1999), Dika (2015) and many more, as I take this to be a firmly established view.

²⁷ Garber (1992) and (2001, p. 35) finds the majority of Descartes' method in rule 5 of the *Rules*.

²⁸ CSM I, pg. 7.

substantive detail presented in the *Rules*.²⁹ Whether or not there is continuity between the *Rules* and part II of the *Discourse* I will leave open, as it is beyond the scope of this chapter. It is worth noting, however, that any connection would merely focus on a relatively small portion of the *Rules* and, might still be unable to explain the link between the *Discourse* and its *Essays*.³⁰ Thus I would like to consider that the *Rules* might simply be a red herring, as Descartes' views may have significantly changed in the long interval between his writing of the *Rules* and the *Discourse*.³¹ Further, without any correspondence regarding the connection to the *Rules* and his later projects, I feel it is best to establish an interpretation based on the *Discourse* and correspondence alone.

Relegating our understanding of the Descartes' method to the *Discourse* does come with some problems of its own. One challenge that some commentators have encountered when taking part II to be the primary location of Descartes' methodological commitments is to find this "method" played out in the *Essays*. On its face, it seems like this should be an easy task; after all, Descartes does claim explicitly that his *Essays* are an exercise in his method. However, when we look into the essays we find no mention of the four rules or their use. For the most part, problems presented in the three essays simply do not break problems down into their simplest parts, and instead of being ordered by simplicity, some are presented in a breathtakingly bizarre fashion—

²⁹ Whether or not these four rules actually bear some connection with the original project of the *Rules* is not important to the project of this essay. However, my impulse is to deny such a relation due to the lack of obvious resemblance in structure and detail, difference in number of rules and lack of any division of the rules.

³⁰ It would also be important to first establish when Descartes' stopped working on the *Rules*. If he had not yet abandoned the project by the time of the *Discourse*, there would be good cause to look between the two for continuity. However, since there is no consensus on the matter, I find it best to search elsewhere.

³¹ Although the dating of the *Rules* is still a hotly contested subject, but this lack of consensus itself is good reason to avoid substantially depending on the *Rules* in interpreting the *Discourse*.

sometimes involving analogies that are difficult to relate to the actual question being answered.³² What is even more troubling is that Descartes himself admits that what appears in his essays fails his very first rule: to admit nothing that is not certain. In part VI of the *Discourse* he explains,

If some of the claims I spoke of, in the beginning of the *Dioptrics* and *Meteors*, shock at first because I name them suppositions...I named them suppositions only so one knows that I believe I can deduce them from these first truths that I have explained below, but I wanted specifically not to do this...³³

So, Descartes notes that because he is not starting with his first truths, his method was not precisely followed (but could be, should he take the time to write it out properly).³⁴

Let's call this lack of correspondence between the four rules of part II and the *Essays* the *methodological problem*.

IV. Isolating the “Method”

Before considering my own solution to this problem, we should narrow our focus to locations where we can find examples of Descartes' method in the most vibrant contrast. As a further constraint, we should remind ourselves that although we most certainly will not find something complete, it might stand to reason that we can find elements or a general outline of how Descartes believes his method should be followed

³² I am thinking specifically of Descartes' "proof" of Snell's law in the *Dioptrics*. Descartes uses the analogy of a man hitting a tennis ball against various surfaces and observing the results. This analogy is particularly difficult to understand that light is considered by Descartes to be a pressure and to move instantaneously, two qualities that are not at all exhibited in the tennis ball. The analogy between light and the behavior of tennis balls presents further difficulty as it is surely something that could be doubted, *contra* Rule I.

³³ AT, IV: 76. This is a claim that Descartes never follows through on and most likely abandons by the time of the *Principles*.

³⁴ Roger Ariew (2010) points out that this claim, while repeated several times in his correspondence, might be recognized by Descartes to be all but bluster.

in practice. Fortunately, Descartes' correspondence gives us rather clear indications of where to begin our examination. Following Descartes' advice to Vatier in February 1638, we should direct our attention to his description of the rainbow as the best place to see the method in action.³⁵

In the opening paragraph of his discussion on the rainbow Descartes reiterates his emphasis on this example in claiming, he "would not know how to choose a subject better suited to show how, by the method [he] uses, one can come to knowledge that those whose writings we have did not have."³⁶ Yet, if we accept the four rules of part II as comprising the method, it is less than obvious how this concrete example could fit into the bounds or be guided by those rules. Descartes begins his discussion of the rainbow with a basic observation: rainbows are not formed exclusively in the sky, but also in fountains. From this simple point he moves on to generalize that rainbows only form when there are drops of water and light present. Descartes then moves further to a simple experiment involving filling a round flask with water and holding it at different angles in relation to the sun and his eye, all while carefully observing the artificial rainbows he produces.³⁷ After exhibiting several observational facts about the angles required for viewing color, Descartes forms several more questions and moves on to more complicated experiments involving prisms and eventually restricted prisms that only allow certain rays of light to pass.³⁸ By the end of the discourse on the rainbow, Descartes produces several tables of data and can state the general conditions required

³⁵ AT, I: 559.

³⁶ AT, VI: 325.

³⁷ AT, VI: 325.

³⁸ AT, VI: 330.

for viewing a rainbow, as well as some general claims about the nature of light, which assumes many of the things he had already proven in the *Dioptrics*.³⁹

If we are to find any insight into Descartes' method, the example of the rainbow should be where it is hiding. Daniel Garber makes an exceptionally well thought out attempt to align the four rules of the *Discourse* with this particular example of the rainbow. However, even Garber admits, "It is by no means obvious how this somewhat confused mass of experiment and reasoning can be fitted into the rather rigid mold of Descartes' method."⁴⁰ At this point we might try to draw one of two conclusions: either there is something missing in the common interpretation of the role the *Discourse* fills, or Descartes wrote a piece to be connected to the three essays that actually bears no relation to them, despite explicitly claiming that there is such a relation. This latter option cannot be completely ruled out immediately, though attempting to give a charitable interpretation to Descartes, one hopes it proves false. It is certainly a distinct possibility that with the *Discourse* being Descartes' first major published philosophic work, he did not fully understand his own method or had simply failed to express it adequately. Perhaps he was, as he often appears elsewhere, quite content to merely bluster and boast. All of these considerations feed nicely into Schuster's characterization of the method as largely nothing more than rhetorical red meat. Thus, it is quite tempting to try explain away the *methodological problem* by claiming that the *Discourse* was simply an overly ambitious project that, when applied to the three essays, did not pan out as he had hoped—or perhaps never could have. However, this seems

³⁹ Laura Georgescu and Mădălina Giurgea (2012) argue that Descartes' experimental method is not used to test prediction but is more a method of discovery, however, as will become clear later on, I believe this cannot be the case. Cf. Sakellariadis (1982).

⁴⁰ Garber (2001, p. 99).

unlikely, in view of the fact that the essays were developed significantly before the *Discourse* was written, which would put Descartes' in an ideal position to align his purported method with what he claims as an exercise in that method. Of course, there are other more elaborate ways to account for this apparent disconnect, but I would like to attempt a more charitable reading before resigning myself to accusing Descartes of gross incompetence or being forced into forging elaborate constructions. My basic contention is that Descartes must have had the *Essays*, at least the *Meteors and Dioptrics*, firmly in mind when composing the *Discourse*, so we should be able to find some connection between them, even if it is merely rhetorical.

To this end, I will take into account some facts about the *Essays* and then revisit the *Discourse*. But before following through with this, I would simply like to point out some general features of Descartes' methodology, independent of the context of the *Discourse*. It has become increasingly clear thanks to a bevy of recent scholarship that Descartes was an avid experimenter and collector of observational data.⁴¹ However, this is not a particularly shocking discovery.⁴² In Descartes' correspondence from the period before the publication of the *Discourse* we find dozens of references to experiments and observations from a wide variety of correspondents. The scope and purposes of these reports is quite broad; at one end, there are atmospheric and astronomical observations, at the other critical experiment-like scenarios being proposed and discussed regarding the speed of light. Of course, Descartes' main source of these reports is Marin Mersenne, who was anxious to communicate and persistently question him regarding

⁴¹ This was also apparent to many of Descartes' early followers who quickly tried to extend the Cartesian experimental program. See Roux (2013b).

⁴² Excellent scholarship has been done on Descartes' experiments from a very early stage, see Milhaud (1918) and Blake (1929a, 1929b).

observational/experimental data. Descartes' love of experimentation was not at all a fleeting interest, or one that was foisted upon him by his correspondents, as certain topics (especially mathematical ones) sometimes seem to be. Observation and experimentation continue throughout his lifetime and after Mersenne dies in 1648, Descartes laments the loss of his friend and equally the loss of his connection to the scientific community and experimental/observational reports.⁴³ Even after Descartes' death an interest in his experimentalism in his correspondence was quickly recognized and was given great attention starting from Claude Clerselier's earliest edition of Descartes' letters, even among the Académie des Sciences.⁴⁴ While not in the least confined to his correspondence, the sheer bulk of discussion contained there should raise interest in the role of experimentation in Descartes' published works and how he might have seen it fitting within his method. It is my contention that following Descartes' own interest in experiment and observation through the *Discourse* and *Essays* will help sharpen the interpretive lens and clarify the lacuna presented by the *methodological problem*. Indeed, I believe that given the seeming importance of experimentation and observation in Descartes' actual practice, it is relatively shocking that it has been so broadly ignored in discussions of his method.

Not only is Descartes occupied with acquiring and creating experimental and observational reports, he is also involved in theorizing over methodological concerns of such reports with regard to theory and he is aware of other work done along these lines.

⁴³ See Descartes to Carcavi, 11 June 1649 (AT, V: 365).

⁴⁴ For example, in the *Procès-verbaux* from 7 March 1691, an experiment is repeated where a lead ball, resting on a pillow, is hit with a hammer. Descartes had claimed that the ball would flatten, although the Académie's results were just the opposite.

At one point, Mersenne writes to Descartes to ask if he has any advice to performing successful and useful experiments, to which Descartes replies,

To this, I have nothing more to say than what Verulam⁴⁵ had written about it except that without being too curious and researching all the little particularities regarding a matter, it is necessary to first make general reports of all the most common things that are quite certain and can be known without expense.⁴⁶

Delving into the *Essays*, we find that *Meteors*, like the *Dioptrics*, is a veritable treasure trove of experimental and observational reports ranging from the mundane common things just mentioned, to the elaborate. The diversity is staggering as the reports range from explaining the various differences in sensation produced by breathing on one's hand in different ways, to a recipe for creating ice during summertime.⁴⁷ But these are not just an uncoordinated mass of experiments; instead, they are put in a specific order, and generally move toward successively more detailed experiments and a set goal. So, if Descartes' method is demonstrably experimental in practice and he seems to be active in the discussion of methodological concerns regarding the incorporation of experiment and observation, how can it be that his methodological work failed to represent this dominant element of his actual research?

V. A Possible Solution

My answer to this question is relatively straightforward: instead of finding one unified method in the *Discourse*, I find two.⁴⁸ When we return to the *Discourse*, keeping

⁴⁵ Francis Bacon.

⁴⁶ Letter to Mersenne, January 1630 (AT, I: 109).

⁴⁷ See (AT, VI: 235) and (AT, VI: 253) respectively, for these particular examples, although you can turn to almost any page of *Meteors* and find similar cases.

⁴⁸ There has been some considerable forward movement toward breaking down the picture of Descartes' method as a monolithic, for example, in Dika (2015).

Descartes' experimentalism and abundance of examples in both *Dioptrics and Meteors* in mind, we find first that it is robustly colored in part VI. Not only are there explicit calls for more experiments, but we can also find a little discussed general plan, describing how to perform valuable experiments and observations. While directly indicating the need for more experimentation to be completed, Descartes insists that sending him experimental and observational reports will not be sufficient, due to a potential lack of rigor from the volunteer. He also points out the possibility of misrepresentation of facts and data stemming from the influence of false theory on one's observations. To circumvent these issues, we are told that it would be better to pay artisans to perform the desired tasks to avoid the risk of wrong theory being infused into the report. Descartes, rather bluntly, ponders,

If there were someone in this world that one could be assured to be able to find the most important things, and the most useful for the public that could be, and for this cause other men engage themselves fully, in every way, to help him bring his ends to fruition, I cannot see how they could contribute anything to him, if not by providing for the cost of the experiments [expériences] he is in need of.⁴⁹

It is not hard to imagine whom Descartes has in mind as this "someone."⁵⁰ While it is easy to view part VI of the *Discourse* as a piece of shameless self-promotion and request for patronage, it is important to note that directly before this apparent plea for funds, Descartes established an order of investigation and notes the importance of experiments

⁴⁹ AT, VI:73.

⁵⁰ Although, if Descartes' original plan were to publish the *Discourse* anonymously, it would be an interesting question to ask how he intended this part of the *Discourse* to bear any fruits.

for advanced knowledge.⁵¹ First, we are told that we must find the principles or first causes of everything in general. Then, now having principles to serve as a guide,⁵² we turn to the most common effects of these causes. From these common effects Descartes says, “I found the heavens, stars, an Earth, and more, on the earth, water, air, fire, minerals, and several other things.”⁵³ Finally, when Descartes wanted to “descend to those more particular [truths]” he found the need to resort to several more specific experiments [plusieurs expériences particulières].⁵⁴ What we see here then is a methodological break between *general* truths and *particular* truths.

Even at this early stage, Descartes recognizes that some knowledge is entirely outside the scope of reason alone. When discussing how he is able to determine between competing explanations based on these principles Descartes notes the following:

I know no other means than by seeking additional experiments [expériences] that are such that their results are not the same if it is one of the ways for explaining it, if it is the other.⁵⁵

This method of experimentation guided by principles simply cannot be found in the four rules presented in part II. My claim then is that the four rules, given their vagueness and lack of reference to anything empirical, in their most charitable reading, might only be considered as a method for discovering the general rules or laws of nature—those very subjects that are in opposition to empirical data, as we will see in chapter II. If this is correct, we can explain why we do not see the application of the four rules in the *Essays*;

⁵¹ “I also noticed, regarding experiments [expériences], that they are that much more necessary the further one advances in knowledge” (AT, VI: 63; CSM I, 143).

⁵² For this Descartes claims he considers God alone. (AT, VI: 64 CSM I, 143).

⁵³ AT, VI:64; CSM I, 144.

⁵⁴ AT, VI:64; CSM I, 144.

⁵⁵ In other words, when Descartes’ principles underdetermine an effect, we must search for a “crucial experiment” (AT, VI: 65).

namely, because the *Essays* deal almost exclusively with *particular* truths and are, therefore, outside the scope of the four rules of part II. This is most readily apparent when we consider that Descartes claimed to not give his principles in the *Discourse*, which in turn gives us reason to predict and absence of the four rules being employed. However, when we come to particular truths, which Descartes claims he will dedicate the rest of his life to discovering and that are the primary focus of the *Meteors* and *Dioptrics*, the method is experimental and observational, thus he defers to the brief discussion of order of enquiry presented in part VI of the *Discourse*.⁵⁶ But if I am right, and we have more method claims than just part II would suggest, it still remains to explain exactly what Descartes believes he has left out of his method; for it would be wrong, as noted above, to impose more method on the *Discourse* than Descartes himself believes to be contained in it.

So then, what are the methodological details absent from Descartes' *Discourse*? The answer, again, is relatively straightforward. First, Descartes does not give us his principles, even though he tells us, albeit in a very general form, how to arrive at them. This method is still sufficiently vague to allow Descartes to rest assured his principles will stay hidden.⁵⁷ But even if we were given Descartes' principles, these two methods seem hardly sufficient to generate any new knowledge on their own. What is also missing is how we are to connect the purely theoretical method and the experimental/practical method—in other words, how to connect general truths and particular truths. Without these principles to guide research, and without explicitly explaining how these principles are to do so in practice, Descartes can be justified in

⁵⁶ AT, VI: 78.

⁵⁷ Descartes is quite explicit about his desire to keep his principles secret. See (AT, VI: 71) for one such example.

claiming that a major element of his method is left out. When we return to the essays with this second method in mind, it is striking to see how often it is employed, and part of the discordance between the *Discourse* and its essays is removed, as we can see the essays as an exercise in this second method without reference to the first more general method.

It should be noted that the separation between these two methods is not complete. It might, in the end, be helpful to view them as part of a singular, more general method, but there are several problems to this type of reading when restricting ourselves to the presentation of the *Discourse*. First, as noted above, Descartes' never gives us any clear way of connecting these two seemingly disparate methods. So, to contend that they are both part of an overarching method, we would need to do a significant amount of filling in the gaps. Second, even if we claim that they are both part of one method, this does not help our interpretive task. The most universal truths will still require stopping after the rules presented in part II, as continuing on to experimentation would result in a category mistake. Particular truths, on the other hand, require going further, and perhaps skipping the first set of rules, jumping to those rules that guide experimentation instead. In both of these cases, the method deals with two classes of truths in two entirely different manners, which justifies looking at both of these different aspects of the proposed method on their own.

When we return to the example of the rainbow, the exemplar of Descartes' method, we can see a very clean application of the method of part VI. First, Descartes lists his general principles, which are noted as suppositions in the first discourse of the

Meteors.⁵⁸ Then, when Descartes decides to discuss the particular phenomenon of a rainbow, he then considers “the most common effects of these causes,” namely, that rainbows only happen when there is water vapor present. Next, Descartes advances to more particular experiments, using flask filled with water to recreate rainbow-like effects. Then he continues to even more particular experiments involving more complex apparatus and specific manipulation of prisms and light. This manner of investigating nature is repeated time and time again in the *Meteors*, following the general pattern of setting out one’s basic principles, observing the most general naturally occurring phenomena, and then moving to particular experiments to help clarify the situation.

There is, however, a glaring hole in my interpretation of the *Discourse*, namely the *Geometry*. To be sure, the *Geometry* is decidedly not an exercise in any form of methodology based on experiment. Indeed, Leon Brunschvicg has even claimed that the *Geometry* is exactly what part II of the *Discourse* is intended to summarize,⁵⁹ which is a theory also endorsed by Gilbert Gadoffre.⁶⁰ This thesis, however, is at odds with the chronology of the composition of the *Discourse* and *Essays*. Remember, that Descartes had begun the preface (later becoming the *Discourse*) before he had even decided to include the *Geometry* in the work, and he had not finished the *Geometry* before the *Discourse* was completed.⁶¹ As further evidence, the 1644 Latin edition of the *Discourse*, did not include the *Geometry* at all. It would seem very strange indeed if Descartes were to allow the *Discourse* to be published without the *Geometry* if it were supposed to be

⁵⁸ AT, VI: 233-235.

⁵⁹ Brunschvicg (1912).

⁶⁰ Gadoffre (1987).

⁶¹ The role of mathematics has been grossly exaggerated in Descartes’ thought. See Ariew. (2014, p. 187-190), (2016), as well as Recker (1993), for an excellent defense of the limited role mathematics plays in Descartes’ philosophy. Cf. Koyré (1968, p. 2-13, 1978, p. 3), and Maull (1978).

the primary example of the method in action. Lastly, given Descartes reluctance to pursue mathematics after the *Geometry* and having not including anything like it in any of his following works, it seems to me too much of a stretch to hold the *Geometry* up as Descartes' ideal representation of his method.

My point here has not been to show that the *Discourse* and its *Essays* are four completely coherent and unified documents. Given the chronology of their composition, I feel it should come as no surprise that they are a bit disjointed and do not clearly exemplify a unified method. However, when we take into account Descartes' repeated claims of presenting examples of his method, highlighting specific cases, and of giving a gloss of the method in the *Discourse*, we can show that part VI has a fairly tight connection with first two *Essays*. While this leaves out the *Geometry*, if we assume that Descartes is giving two methods, oriented toward their own object of knowledge, we might be able to hold, along with Gadoffre and Brunschvicg, that part II might be best associated with the *Geometry*, and still have some explanatory tools for his litany of methodological claims.

VI. Conclusion

If all this is correct, it is difficult to see why we would be looking for only one method in the *Discourse* in the first place. Given Descartes' practice, which we know through his correspondence, the traditional emphasis on part II of the *Discourse* as the solitary method simply presents too much of a discord and generates an insoluble *methodological problem*. When we take part VI of the *Discourse* as playing a more substantive role, the *methodological problem* mostly disappears, as there is a clear connection through the prescribed experimental and observational method. A further question might arise given my interpretation as to why this matters at all, given that we

should accept that the method, regardless of how many there are, is surely not completely guiding Descartes' projects in natural philosophy. My answer to this question will become clearer in the chapters that follow, but I believe that recognizing the rhetorical division between two distinct methods in his writing comes with three interconnected benefits. First, given that Descartes believes that his method extends to all subjects, we can begin to explain how it could have possibly been expected to cover topics that range from metaphysics to medicine. Second, it gives us a clear vantage point to analyze why Descartes subsequent works were structured as they were, as well as giving more freedom in interpretation of some of his lesser discussed works, as will be seen in chapter three. Lastly, viewing Descartes' experientialism as overt will help us connect his influence more clearly to several of the earliest proponents of Cartesianism, as will be seen in chapter four.

CHAPTER TWO:

DESCARTES' PHILOSOPHY OF SCIENCE AND EXPÉRIENCE

I. Descartes the Rationalist

Among secondary literature, it has become common to accept that Descartes does allow for some role for experiments in his system of natural philosophy—we are now at a point where the caricature of Descartes-the-rationalist is now simply a cliché.⁶² Yet there still does not seem to be any genuine consensus on what the role of experiments and observation entails. In one of the earliest pieces directly addressing the issue, Gaston Milhaud claims that Descartes, at times, gives the impression of being a “perfect experimenter,” and thus likens the role experiment plays in his philosophy to that of a contemporary scientist.⁶³ While subsequent work in Descartes scholarship has cast a significant amount of doubt on this type of interpretation, there is still great confusion over how prominently to feature experimentation in interpreting the Cartesian corpus. Connected to this, there are further questions as to what impact Descartes’ views on experimentation had on the Cartesian tradition.⁶⁴ Dennis Des Chene, for example, writes of Descartes that, “he is, *malgré lui*, one of the fathers of the experimental philosophy.”⁶⁵ Why then do we still consider that Descartes stands in some sort of

⁶² Roux (2013).

⁶³ Milhaud (1918, p. 227).

⁶⁴ See Blake (1929a and 1929b), Schouls (1972), Gaukroger (1995), Garber (2000, essay 5), Georgescu and Giurgeo (2012), and Bos and Verbeek (2013) as just a few of the more prominent examples.

⁶⁵ DesChene (1995, p. 559).

opposition to the experimentalist trends of his day even if we reject the rationalist cliché? Of course, the rationalist themes in Descartes' works have a very long tradition of commentary and are not dispensed with instantly. Including experiment into an interpretation is no easy task and has sometimes been referred to as an obstacle in understanding Descartes' method in scientific enquiry.⁶⁶ Yet, while not an obstacle in the sense of something to be avoided, the empirical in general does provide a significant tension between various elements of Descartes' philosophy of science. Indeed, much of the insight we can gain regarding Descartes' use of experimentation, observation, and the like, in developing his natural philosophy comes from his private correspondence with his peers, which creates two problems. First, we do not see the same level of attention to transmitting observational and experimental data in some of his major works. Second, while we can find a wide variety of references to observation, experience, and experiment, these comments can at times seem scattered or even contradictory. We can, for example, find references to experiment and observations that are glowingly receptive; yet, in other places, see signs of disdain for empirical evidence in relation to scientific theory.

Adding to the general problem of tracing the concept through Descartes' work, there are linguistic problems as well. The French word most often used in his correspondence, 'expérience', can be translated as 'experience', 'observation', or 'experiment' depending on the context. In many places, exactly how to translate the

⁶⁶ See, for example, Koyré (1968, p. 18). Gaukroger (1995, p. 157) tracks this rationalist reading back to the late 19th century, and notes, importantly, that this was certainly not the interpretation of Descartes' contemporaries—especially not of Newton.

term is simply left underdetermined by the text.⁶⁷ My general strategy will be to treat the term on a case by case basis, but still focus on how any empirical data can fit into his sophisticated system of natural philosophy, placing special emphasis on cases that are definitively referring to experimentation.

This chapter will aim to answer several questions surrounding the role of experiment, experience, and observation in Cartesian natural philosophy. First, I will address how metaphysics informs observation; ultimately concluding that metaphysics was viewed by Descartes as the interpretive lens necessary to view any empirical data. Second, I will look at the apparent tensions in Descartes' frequent dismissal of genuine empirical data as well as his acceptance of faulty reports—highlighting that the generality of the Cartesian system makes it impossible to assign any consistency to Descartes' approach. This will in turn raise objections to relying too heavily on conflict between Descartes' principles and observation data when interpreting the role of experience. Lastly, I will address whether or not experiment can serve as a verification tool or as a means of discover. While it is commonly held that experience can only play a role of discovery, I will show that discovery and verification, in the Cartesian system, are interwoven concepts.

Before we begin a positive project establishing the role of experience in Descartes' philosophy of science, it will be worthwhile to briefly examine Descartes' rationalist caricature, as it was not formed without some evidence. To understand how the caricature of Descartes rose to prominence, we must do two things very carefully: first, abstract Descartes from his connections to intellectual circles and context he was

⁶⁷ See Clark (1976, p. 152) and (1989, p. 19-24) for a detailed explanation of the many translations of 'expérience' in Descartes.

surrounded by, and second, focus on only select published works and a carefully selected batch of letters. If we focus, for example, on the *Meditations*, it is fairly easy to paint a vibrant picture of Descartes comfortably absorbed in his armchair. As is well-known, in the *Meditations*, Descartes is forced by a sort of hyperbolic doubt to turn away from sense experience, thus directing his attention inward and first examining himself, along with his own ideas in order to re-establish a firm foundation for the rest of his philosophy to be built upon. From this inward approach Descartes finds that he is a thinking being, his own existence cannot be doubted, the soul is immortal, and that God exists—all this from without ever needing to leave one's stove-heated room!

Apart from the rationalist image that emerges through a superficial gloss of the *Meditations* and a general overemphasis of his metaphysics and epistemology, there are also substantial bits of Descartes' correspondence depicting a philosopher removed from the empirical world. In a letter to Mersenne, dated 18 December 1629, for example, when speaking of the effect of air resistance, Descartes announces his lack of concern for experimental data.

As for the magnitude, I ignore it. And even if he can make a thousand experiments to find it more accurately, I do not have to take the trouble to do them myself, if they cannot be explained by reason.⁶⁸

Much later, in February of 1639, Descartes echoes this sentiment to Mersenne, this time discussing empirical measurements on the angle of refraction.

Mr. Petit and his arguments are laughable, and it seems to me, we no longer have any reason to listen to him when he promises to refute my refractions through

⁶⁸ AT I, 100.

experiments—as if he could show, with a poorly made square, that the three angles of a triangle do not equal two right angles.⁶⁹

Given these fairly damning passages, one can begin to understand the temptation to label Descartes the arch-rationalist. However, there is clearly a flood of evidence that he was much more systematically engaged with the world of observation and experiment than the above two quotations suggest.

II. Descartes' Experience with *Expérience*

We have some evidence of Descartes' interest in observations developing at a relatively early stage through his encounter of Issac Beeckman.⁷⁰ Descartes met Beeckman in 1618, and the exact scope of his influence on Descartes is still debated. After a fairly ugly falling out with Beeckman, Descartes himself vehemently denied any influence,⁷¹ but most scholars would agree that this is nothing more than prideful hyperbole. Earlier correspondence paints a much different picture of Beeckman's role in Descartes' development. In a letter to Beeckman from 1630, Descartes admits to having hoped Beeckman's observations could help him greatly.⁷² Additionally, some of Beeckman's proposed experiments were discussed also at some length. In a letter from the 22nd of August 1634, Descartes attacks the crude design of one of Beeckman's proposed experiments and suggests a greatly improved variation of it to settle their

⁶⁹ AT II, 497.

⁷⁰ Although Beeckman's own understanding of the interplay between reason and experience is complex and related to his conception of physico-mathematics. See Buzon (2013).

⁷¹ Descartes writes a scathing rebuttal of Beeckman's claim to have taught him anything, "it has been my custom to teach myself, even from ants and worms, and they will think that this is how I have learned anything from you" (AT I, 156). Although in an earlier letter, Descartes claims that Beeckman can claim all Descartes' writings as his own (AT X, 163). See van Berkel (2000) for an excellent account of Beeckman's potential influence and a detailed analysis of their falling out.

⁷² AT I, 156.

debate on the speed of light. In this experiment, Beeckman, believing that the speed of light is finite, proposed a simple experimental set up to measure its speed. Descartes, on the other hand, believed that the speed light was infinite. Beeckman's experiment ran as follows: "someone holds a torch in his hand at night and moves it; if he looks in a mirror a quarter mile away, he will be able to tell whether he feels the movement in his hand before he sees it in the mirror."⁷³ Descartes agrees that this type of experiment would settle the debate, and even goes so far as to claim a positive result for Beeckman would spell total demise for Descartes' philosophy, but he goes on to propose a significantly improved version of the experiment. Descartes' experiment, which he claims already has been observed and confirmed, involves observing the location of the sun during a lunar eclipse. If Beeckman were correct regarding the speed of light, which he supposes to be slow enough to notice within a half mile of travel, we should observe the sun to be in a different position than it actually is, due to the requisite time for light to pass from the earth, reflect off the moon, and return to the earth to be seen.⁷⁴ Descartes then cites numerous astronomers who have confirmed that the sun is not seen at the position Beeckman's theory would imply, and consequently the foolishness of Beeckman's position is sufficiently demonstrated.

Yet another instance of Descartes' early interest in experimentation and observation comes in the *Rules*. While incomplete and never published in Descartes' lifetime, we can still find interesting claims regarding the nature of experience beginning to emerge:

⁷³ AT I, 307.

⁷⁴ AT I, 310.

But take someone who thinks that nothing in the magnet can be known which does not consist of certain self-evident, simple natures: he is in no doubt about how he should proceed. First he carefully gathers together all the available observations concerning the stone in question; then he tries to deduce from this what sort of mixture of simple natures is necessary for producing all the effects which the magnet is found to have. Once he has discovered this mixture, he is in a position to make the bold claim that he has grasped the true nature of the magnet...⁷⁵

This already is quite close to an experimental procedure to discover exactly how a magnet works. Further, in this passage we can also note that Descartes supposes the role of observation to come only after he has concluded that the subject in question cannot be resolved through reason alone. Establishing a distinction between truths that can be known through reason and those that must be discovered with the aid of experience is a distinction, I will contend, that is upheld throughout Descartes' career.

III. Reason vs. *Expérience*

Even once we make the easy transition to viewing Descartes as intensely interested in observation and experimentation, conclusively pinning down the role they play in his philosophy has yet more difficulties to overcome. At times he seems to have a significant degree of skepticism regarding their importance and use in natural philosophy.⁷⁶ However, the majority of cases of overt skepticism applied to observation and experimentation is not necessarily evidence in favor of a purely rationalist method

⁷⁵ CSM, 50; AT X, 427.

⁷⁶ This fact has already been highlighted in the passages taken from the two letters to Mersenne cited above.

tout court.⁷⁷ Instead, we should see them more generally directed against poorly understood or executed observations and experiments; although what Descartes considered to be poorly understood or executed observations will require some discussion later on.

We can find instances of Descartes speaking out specifically against poorly understood experience as early as the *Rules*:

We must observe that while our inferences from experience are frequently fallacious,... none of the mistakes which men can make are due to faulty inference; they are caused merely by the fact that we found upon a basis of poorly comprehended experience.⁷⁸

We can find an even stronger example of the same claim in Descartes' *Meteors*. While speaking of a disagreement between the measurements taken by Francesco Maurolico regarding the rainbow and his own, Descartes claims this disparity "indicates the little trust one should place in observations which are not accompanied by the correct explanation."⁷⁹ Later in a letter to Huygens from 1643, Descartes is incredibly explicit of his lack of faith in the work of others when he claims quite bluntly, "I have little trust in experiments I have not performed myself."⁸⁰ The contrast Descartes makes between poorly done experiments and experiments performed properly by himself is apparent, and so we can acknowledge that his rejection of empirical data is far from wholesale, even though what counts as a properly performed experiment is never truly defined.

⁷⁷ Although it would be fair to say that he does have a general preference for the *a priori* as knowledge from reason alone holds the highest degree of certainty.

⁷⁸ AT X, 368.

⁷⁹ AT VI, 340.

⁸⁰ AT III, 617. Descartes goes on, in this passage, to also cite the poor skill of artisans making the instruments necessary for the experiment, thus undermining even an experiment he was trying to recreate for himself.

However, we can see a broad outline emerging for his own requirements for observational data in his earlier comment to Huygens, and in the *Discourse*, where observation must always be “accompanied by the correct explanation.” But to understand this point clearly, and exactly what Descartes is pushing against, we must look slightly backwards to one of his early influences, Francis Bacon’s.

IV. Order and Method in *Expérience*

There is no doubt that Descartes read at least some of Bacon’s works, as he is mentioned by name in correspondence. The experimental method was rapidly becoming the vogue during Descartes’ time and the subject of scholarly debate. When asked by Mersenne how one should conduct successful experiments, Descartes is fairly quick to defer to Bacon—albeit with a slight criticism of his exact method.

To this, I have nothing more to say than what Verulam had written about it except that without being too curious and researching all the little particularities regarding a matter, it is necessary to first make general reports of all the most common things that are quite certain and can be known without expense.⁸¹

Seven years later, this criticism is echoed again in the *Discourse on Method*. Here, as noted in Chapter I, Descartes not only claims that we must start with general observations before moving to particulars, but before any observation we must first have already found some basic principles to guide us. If we take Bacon as propounding a method that starts from sensory experience and moves from this mass of information

⁸¹ Letter to Mersenne, January 1630 (AT I, 109). Other references to Bacon can be found in AT I, 195-196, and 251. This seems to be directly contrary to what is written in the *Rules*: “Before tackling any specific problems we ought first to make a random selection of truths which happen to be at hand, and ought then to see whether we can deduce some other truths from them step by step, and from these still others, and so on in a logical sequence” (AT X, 384 ;CSM I, 23).

toward axioms/principles, we can take Descartes as rebutting this and moving in just the opposite direction.⁸² Descartes' worry in this matter seems to be that even if we collect a mass of information, we will still need to devise a consistent method for interpreting and extracting information from it. Basic sense perception can lead us to ungrounded conclusions, such as the taste of food being located within the food and not the perceiver, dreams being perceived as reality, or white things perceived as yellow when sick with jaundice. In these cases, his insistence on theory before perception seems well-placed. Principles, discovered through reason alone, are supposed to serve to weed out faulty observations from true ones, and equally help pin down the content of such observations to ensure that our scientific pursuits are well-founded. In other words, if observation and experimentation are used to "interrogate" nature, Descartes' principles are to serve to regulate what can be asked and what would count as an acceptable answer; without these guidelines any interrogation would be rather pointless.

We can now start to piece together some of outlines of the role of observation and experience. First, the role of theory, (i.e., the development of basic principles through reason alone) is in some sense prior to observation and experimentation. We can further infer that this is a one-sided relationship, insofar as the basic principles inform observation but observation does not inform the basic principles. Thus, in a limited sense, observation plays a secondary role in Descartes' philosophy. I say "limited sense" because what we have discussed up to this point has not ruled out observational data as a possible source of scientific knowledge; such data simply must be supplemented before it can be accepted. Indeed, as we saw in chapter I, observational and

⁸² Bacon (2000 p. 112, 131).

experimental data for Descartes will have what could be considered as a primary role in certain areas of scientific enquiry.

At this point it might be helpful to return to the first two anti-experimental quotations above, where Descartes rejects an experimental data in refuting his own position on refraction and air resistance. In both cases there is no complete rejection of experimentation's relevance to physics, but instead what seems to be an accusation of a simple category mistake—and therefore misunderstood *expérience*. In the same way that no one would accept a refutation of arithmetic through observation or experiment, Descartes refuses to accept such a refutation for several laws of physics and some basic metaphysical principles—in this case for refraction and the relationship of sound to vibration.

Despite the priority of reason, the need for accepting empirical data is never denied, because the basic laws and principles are insufficient to explain all observable phenomena. The simplicity of Descartes' laws of nature and principles of natural philosophy underdetermine their effects due to the extreme simplicity required to be included as laws or principles. Descartes acknowledges a great many facts, such as the interval of the tides, the temperature that water freezes at, the composition of seawater, and many others that will be left unexplained if he were to attempt explanations based only on principles derived through purely *a priori* means. We have then a kind of two-tiered system, consistent with the two methods outlined in the previous chapter. For those things to which we can apply reason alone, clear and distinct perceptions, we have no need to look at the actual world; for everything else, we will need careful observation

and experiments, which must align with the basic precepts of reason.⁸³ This two-tiered system is a natural consequence of Descartes' belief that the undergirding structure of the world, which lies beyond the capability of our five senses, could have been organized in a radically different manner than the way we actually find it.⁸⁴ This thought is most clearly expressed in Descartes' often-quoted two-clock example where he draws an analogy between our experience of the world and that of our perception of two different clocks. We are told that we merely see the surface of the world, just as we only see the surface of the clock, and from this information alone we can begin to draw hypotheses as to the inner workings, which are beyond our senses. Of course, in the clock, there could be a number of different arrangements of cogs, springs, and wheels that would create a clock that keeps accurate time, and Descartes claims that the same holds of our world as well. Because nature is underdetermined in this way, we must resort to different methods to come to a full picture of the inner workings. These two types of truths, the empirical and the *a priori*, are also separated by varying degrees of certainty. The former group is categorized as merely *morally* certain, while the latter group is considered absolutely certain, which is to say we cannot help but assent after we have clearly and distinctly perceived a particular truth, and we cannot conceive of them as being otherwise.

⁸³ See also Loeb (1990).

⁸⁴ While my Descartes point here is simply that the microscopic world might have been ordered differently, there is good reason to believe that this view could be taken to a much further extreme, given Descartes discussion of the eternal truths. While Curley (1984) argues against this point, both Nadler (1987) and Kaufman (2005) provide an excellent grounding for a more thoroughgoing interpretation of the doctrine of the eternal truths that entails they could have been otherwise. However, even if Descartes believes the eternal truths cannot change, that does not entail the outward appearances will remain the same.

This relatively uncontroversial interpretation of Descartes' integration of experiment and observation as being needed to supplement reason, yet still governed by it, goes a long way to explain instances of overt rejection of data. However, even restricting this study to the subset of Descartes' natural philosophy that is open to the use of experiment and observation, we are still presented with several interpretive problems. First, we need to answer on what grounds he rejects experimental and observational reports that pass muster with regard to reason? Second, can observation and experimentation fill a role as a verification or discovery process at all? Lastly, and related to the previous question, does Descartes accept refutation of theory based on experiment or observation—in other words, does he accept anything like critical experiments? To answer these questions, we will have to get a bit more precise on the variety and kinds of reports Descartes had dealt with.

V. Accepting and Rejecting: Observational Reports

In his renowned *System of Natural Philosophy*, Jacques Rohault (1618-1672), being the meticulous experimenter that he was, diligently reports the effect of sticking his finger directly in his eyeball.⁸⁵ Of course, the result is visual disturbances: in this case, seeing double. This type of observation is often repeated and communicated during the early modern period. Descartes himself excitedly reported the results of a similar experiment where, after resting his head on his hand for some time, was able to see multiple coronas surrounding a candle on his boat.⁸⁶ Both philosophers had quite different purposes in mind for this type of experiment, but both deemed even these very common instances important enough to be communicated; indeed, Descartes even saw

⁸⁵ Rohault (1987 vol. I, pg. 256).

⁸⁶ Descartes to Golius (AT I, 319). A similar example is brought up in *L'Homme* (AT XI, 161). An even earlier example is found in a letter to Mersenne, 18 December 1629.

fit to include this experiment later in his *Meteores*, along with a great many other simple experiments the reader could easily try without any elaborate apparatus.⁸⁷ The veracity of such simple experiments are hardly questionable; the reader needs only to stick his own finger in his eye to replicate the results of Rohault and Descartes. Descartes clearly had a preference for just these types of general and readily available experiments. However, simple experiments and observations such as these, as important as they might have been for the time, were not always sufficient to explain the more complex phenomena. More elaborate and difficult to perform experiments, as well as rare observations, were necessary and frequently communicated between Descartes and his correspondents. Surrounding the communication of these more elaborate experiments or rare observations, Descartes offers a full spectrum of reactions. At times he was delighted to receive the data and quickly incorporated it into his own work. Quite understandably, in other cases he is rather skeptical of the purported results, and in yet other cases he is outright dismissive.

In a letter from April of 1634 to Mersenne, Descartes dismisses out of hand a series of experiments performed by Galileo relating to the motion of the earth. The reason for the rejection of these experiments is less than clear. Descartes himself cites that there may be “other reasons” that explain the result, but he remains no less convinced that the earth in fact moves—obviously, for different reasons.⁸⁸ In a much later exchange with Elisabeth, Descartes is quite dubious of the benefits of a widely reported healing fountain.⁸⁹ According to him, it simply would not be conceivable for a single remedy to be able to cure so many different ailments. Descartes is equally

⁸⁷ AT VI, 351-352.

⁸⁸ AT I, 287; CSMK, 43.

⁸⁹ AT IV, 531. Elisabeth expressed her own skepticism as well.

judicious in deriding the purported efficacy of astrological prognostications, instead ascribing the effects to mere self-fulfilling prophecies, with no reference to astral influence at all.⁹⁰ Even with his most trusted correspondent, Mersenne, Descartes is sometimes fairly skeptical of reported experimental results or observation. In April of 1634, Descartes asks, through Mersenne, for anyone to recreate an experiment that he had recently read about. As Descartes recounts, a canon is pointed directly upward and fired, afterward the cannonball is reported to have never returned to earth.⁹¹ Mersenne, upon this request, diligently recreates the experiment, firing a large rifle directly upward. He reported back that the ball was never found, which confirmed the original report. Descartes, however, is unsatisfied with Mersenne's results. Instead he suggests that the experiment be repeated with some significant adjustments. Instead of the rifle, he requests a larger canon be used attached to a series of weights and counterbalances and suspended above a large hole dug in the ground in an attempt to remove any chance of the ball straying from the perpendicular due to recoil movement.⁹² It is important to note that even though Descartes believed that the reported outcome of the ball not returning to earth aligned perfectly well with his theory, the experimental setup needed substantially more rigor before he could accept it at face value.⁹³

All of this might strike the modern ear as being a few relatively uninteresting examples of good scientific method casting off the nonsensical and pseudo-scientific. However, as anyone who has spent some time reading Descartes can attest, he has no shortage of far-fetched beliefs and is not always as judicious regarding other poorly

⁹⁰ AT III, 15.

⁹¹ AT I, 287.

⁹² AT I, 293.

⁹³ Passages such as these do give some credence to Milhaud's glowing approval of Descartes' experimental methodology.

substantiated observational and experimental reports. In perhaps the most famous and telling example, Descartes claims in the *Principles* that his laws of nature, along with subtle matter, can explain the most “rare and marvelous effects,” such as: a dead person’s wound suddenly bleeding when a murderer enters the room, telepathic connections between friends or enemies, and premonitions.⁹⁴ At this late stage in Descartes’ career, it seems as if he is willing to accept the most far-fetched reports as credible and worthy of inclusion into his mechanical theory of explanation. The question arises: is there any consistency in Descartes’ reasoning for rejecting so many experimental and observational reports and accepting a wide variety of others?

There are a number of possible interpretations to give here. First, at the most superficial level, we should account for Descartes’ own explicit standards for accepting reports. As we saw earlier, Descartes prefers experiments he is able to perform himself and believes that others are simply too prone to skewing their results to fit a particular theory. Thus, in the *Discourse*, he claims that it will be necessary to either perform each experiment or observation himself or pay a skilled artisan to perform it for him.⁹⁵ Of course, Descartes does not adhere to his self-prescribed rules. The vast majority of reports that Descartes received were not from anyone who subscribed whole-heartedly to the Cartesian system. Given that most of the reports he receives are unsolicited, this might easily be forgiven. However, even when Descartes asks for some specific experiment or observation to be made, he almost never offers compensation per his requirement. Perhaps, given the *Discourse*’s incredibly blunt request for patronage and the lack of subsequent funds pouring in, it is not terribly surprising to see such a

⁹⁴ AT IX, 309.

⁹⁵ CSM I, 148; AT VI, 72-73.

demand for costly rigor fall by the wayside. It is, after all, more than clear in his correspondence that he is not letting any observations or experiments go simply for not conforming to the rigorous standards laid out in the *Discourse*.

There are other options beyond Descartes' own standards for making sense of when he accepts and rejects observational reports from his correspondents. The received view is that Descartes simply rejects anything that does not correspond with his system and actively adopts or attempts to explain anything that might cleanly fit within it.⁹⁶ This view is quiet attractive, as it offers a clean explanation and fits nicely with the image of Descartes qua methodologist. There is good textual evidence supporting such a reading. For example, we can look toward Descartes' well-documented insistence on rejecting the possibility of a void.⁹⁷ Here, it is important to note that Descartes rejects even the possibility of accepting any experimental evidence for the existence of a void. This sentiment is most clearly expressed in a letter to Mersenne from the 31st of January 1648.

I do not know, given that your researchers of the void want to do their experiment in a chamber where it is so well sealed that the outside air would have no contact there. This is what they will not easily accomplish. But, if they do accomplish it, I assure you that the mercury will not in any way fall from the hose; not because it is lighter, nor that the column of air resists it more, but because there is no place in the chamber where it can move to, because it will be totally full of air.⁹⁸

⁹⁶ Bos and Verbeek (2013).

⁹⁷ See Chapter V for more detail on this subject.

⁹⁸ AT V, 116.

We can see Descartes' fears of theory-ladenness, first expressed in the *Discourse*, strongly reiterated. Any report of a void will necessarily be unacceptably infused with false theory, directly contradicting one of Descartes' most basic principles; thus the observation must be reinterpreted at best, or completely rejected at worst. The principle here "that nothing can have no property" is prior to any and all experience.

There are, of course, several other examples in a similar vein where Descartes openly rejects observational reports due to their disagreement with his own philosophy. All this again strongly reinforces the view that he is only willing to accept something if it is already in agreement with his own expectations and theoretical commitments. This reading has the further implication that any empirical evidence cannot be used to either verify or falsify his core commitments. In other words, many of the results of experimentation are already predetermined by Descartes' physics—unexpected results force radical reinterpretation to fit. However, while this reading can account for some cases (such as experiments on the void above), it fails to adequately address a great many other cases where the conflict of observation and principles is less than clear. Indeed, I believe that cases like the void where there is clear conflict between experimental results and core theory are incredibly rare. To highlight that Descartes' rejection and acceptance of various observational and experimental reports is more complicated than initially thought, I would like to focus on three features of Descartes' system: namely, his belief that his own basic principles underdetermine effects, that a system must be judged by its explanatory power, and his apparent endorsement of crucial experiments.

VI. Problems of Interpretation

By the end of the 17th century a persistent objection against Cartesianism had solidified; namely, that even though Descartes and his followers positioned themselves as against occult explanations and empty theory, they had fallen into just that. The basic objection, repeated most vocally by Huet, is that the Cartesian system can, in fact, explain anything it likes by a means of unspecified shapes, motions, and bits of matter. This objection becomes even more salient given the history of Cartesianism, as we can find concrete examples of early Cartesians attempting to explain a variety of subjects that most likely would have shocked Descartes—such as the biblical description of creation or astrology, among other topics.

Descartes himself expressed his concern for the extreme generality of his principles and their potential explanatory overreach rather early in the *Discourse*.

I venture to say that I have never noticed anything...which I could not explain quite easily by the principles I had discovered. But I must also admit that the power of nature is so ample and so vast, and these principles so simple and so general, that I notice hardly any particular effect of which I do not know at once that it can be deduced from the principles in many different ways.⁹⁹

Here we can notice not only that all phenomena can be deduced from his principles, but that the very deduction that explains the phenomena could be performed in many different ways, thus doubling the generality problem. In the *Discourse*, the solution to both layers of this problem is found through continued observation and experimentation, which ignores more sophisticated problems of interpretation.¹⁰⁰

⁹⁹ CSM I, 144; AT VI, 64.

¹⁰⁰ CSM I, 144; AT VI, 64.

However, shortly after the *Discourse*, a more refined solution to the problem of overgenerality beings to emerge. In a letter to Morin dated 13 July 1638, Descartes claims that it is a cause's ability to fit too many different effects that helps us to solidify its status as the true cause and explanation of those effects. This type of solution is echoed several times in the correspondence and then again in part IV of the *Principles*.¹⁰¹ Thus, if a set of principles can explain more phenomena, it is a sign of a good starting point for Descartes. If this is indeed Descartes position, it becomes difficult to believe that he would have found Huet's objection troublesome at all—it's not a bug, it's a feature. Descartes' position also makes it difficult to hold that he only accepts observational reports if they accord well with his principles, as he himself believes that his principles can explain *any* observed phenomena, and further that the role of such phenomena is to be used to help determine, in some way, the correct explanation.

There is another passage in the *Discourse* that sheds more light onto exactly what role observational reports are supposed to serve in Descartes' philosophy where he proposes an important role for something akin to crucial experiments. Speaking again on how to determine which explanatory application of his principles is the correct one, Descartes states in part VI of the *Discourse*, "I know of no other means to discover this than seeking other observations whose outcomes vary according to which of these ways provides the correct explanation."¹⁰² There are two things to note regarding this passage. First, there is at least an apparent willingness for his principles to be challenged, or at a minimum, for a definitive empirical basis to be established, allowing his system to be confirmed or to challenge other theories. At surface level at least, we do not see the

¹⁰¹ AT IX, 105, 324.

¹⁰² CSM I, 144; AT VI, 65.

dogmatic refusal of all observations that do not agree with his theory. Second, this kind of call to put rival theories to the test is a bit of a singularity in Descartes' published works, occurring only in part VI of the *Discourse*. In his correspondence, while I have not been able to find any explicit acceptancy of crucial experiment, we can see these types of crucial experiments employed in practice.

VII. Crucial Experiments and Verification

As discussed in more detail in chapter I, we saw in an early exchange with Beeckman that Descartes was keen to quickly disprove Beeckman's view that the speed of light is finite. There, the most efficient method to refute Beeckman was to propose an experiment that would neatly decide between the two hypotheses.¹⁰³ This appeal to a crucial experiment-like scenario is equally well demonstrated in a later exchange with Plempius in 1638. Among the wide range of objections that Plempius and Fromundus bring up is a central criticism of Descartes' theory of the heart's function. In short, Plempius objects that heat cannot possibly be the explanation for the circulation of blood as even cold blooded animals' blood circulates. In response, Descartes cites a rather dubious experiment reportedly performed recently by himself.

But if you were with me now, you would have to admit that even in the coldest animals this movement proceeds from heat. For you would see, in fact, the tiny heart of an eel I took out this morning, seven or eight hours ago, giving no signs of life and already dry on the surface, reviving and beginning to beat rather rapidly when a little heat is applied to it.¹⁰⁴

¹⁰³ Although, of course, Descartes failed to consider the third option that light moved many times faster than Beeckman had believed.

¹⁰⁴ AT II, 66.

These examples, among a great many others contained in the Plempius/Descartes correspondence, show Descartes' interest in using observational and experimental reports as tools to rule out competing explanation. In cases where he engages in disproving others, Descartes is all too happy to suggest crucial experiments, but there is not much evidence to show that he ever endorsed a similar method regarding his own many possible application of principles to a given phenomena. I have been able to find only one instance where Descartes turns the crucial experiment inwards. In a letter to Ciermans, he claims that an experiment could cause him to change his explanation of the color red.¹⁰⁵

At this point, I should reiterate that even though there are several clear examples of the use of crucial-experiment-like scenarios in his correspondence, the only explicit acceptance of crucial experiments as a means for determining between competing theories occurs in the *Discourse*. It is glaringly absent in the *Principles*, and equally ignored throughout the correspondence. The endorsement of crucial experiments is at best an abnormality. Descartes' acceptance of crucial experiments becomes equally more problematic when we consider whether experimentation can be used as a means of discovery or verification. If we consider again Descartes' belief that any phenomena could be explained by his principles in more than one way, it is difficult to see how any experiment could serve as a verification tool.¹⁰⁶ Indeed, any one experiment would appear to verify any number hypotheses that employ various applications of Descartes' principles. Commentators tend to agree, however, that experiment serves as a means of

¹⁰⁵ AT II, 75.

¹⁰⁶ Schouls (1972) argues that experiment could not serve to verify a hypothesis as any disagreement would constitute a break from method and, therefore, a break from reason. I believe that since so much of Descartes' science is not based on reason alone, nor does it require absolute certainty, Schoul's argument falls apart.

discovery, while verification runs counter to Descartes' refusal to accept experimental evidence against his principles, as well as the underdetermination problem. The most prominent examples of Descartes systematically using experiments often show him engaged in asking a simple question and designing an experiment to solve it. For example, when Descartes goes about discovering how light can form a rainbow, he sets up a simple experiment to determine at what angles in relation to the observer a flask full of water will produce the color red when held to a light source.¹⁰⁷ There are abundant examples where experiments are used to generate unexpected effects, identify necessary conditions for the occurrence of phenomena, extend the domain of investigation, and identifying a causal history.¹⁰⁸ However, nowhere is Descartes' use of experimentation designed to actively test predictions of a theory, and thus cannot serve as a verification tool. This account, at least in part, seems true, but it fails to sufficiently account for the unity of Descartes' natural philosophy. Descartes believed that the strength of his system is derived from the variety of phenomena it could explain—indeed, this is Descartes' solution to the famed two-clock example.

To square Descartes' various claims of the strength of explanation, we must consider the strength of any given explanation in light of not any single experiment, but against the backdrop of a great many. This is best exemplified within the exchange between Descartes and Plempius. In this example, Descartes is attempting to prove his hypothesis that the microscopic particles that make up water are shaped like tiny eels and that this shape is sufficient to explain its properties. As each different observation is supposed to bolster the hypothesis, I include the entire rather lengthy passage.

¹⁰⁷ See Buchwald (2008) for a more detailed account of the series of experiments leading to Descartes' explanation of the rainbow.

¹⁰⁸ Georgescu and Giurgea (2012, p. 179).

If water is more fluid and harder to freeze than oil, this is an indication that oil is made of parts that easily stick with one another, like the branches of trees, while water is made of more slippery parts, like those with the shape of eels. But experience shows that water is more fluid and harder to freeze than oil. Therefore, etc.

Similarly, if cloths soaked in water dry more easily than those soaked in oil, that is an indication that the parts of water have the shapes of eels, for they easily come through the pores in the cloth, and that the parts of oil have the shapes of branches that become entangled in the same pores; but experience, etc.

Similarly, if water is heavier than oil, this is an indication that the parts of oil are like branches, and so leave many gaps around them, and that the parts of water are like eels, and thus are content with less space; but, etc.

Similarly, if water evaporates more easily or, as the chemists say, is more volatile than oil, this is a sign that it is composed of parts which, like eels, can easily be separated from one another, while the parts of oil are like branches that are more closely intertwined. But, etc.

Although each of these considered in isolation gives only some probability, taken together they amount to a proof.¹⁰⁹

In this scenario we see a number of simple experiments and observations mutually supporting the basic hypothesis. Each bit of empirical data serves an essential support of the scaffolding, yet no single piece is enough to account for the whole structure. Each experiment or observation here serves to discover a new property of water or oil, but no

¹⁰⁹ Descartes to Plempius, 20 Dec 1637 (AT I, 476).

single experiment is used to actually test the hypothesis that water particles are eel-shaped. However, when taken as a complete set of experiments, they serve precisely as a verification of Descartes' hypothesis. The interlocking nature of observational reports in Descartes gives them the unusual character of serving both as a means of discovery and a verification tool at the same time.

VIII. Conclusion

In this chapter I have argued that Descartes' metaphysics guides his experimentation and serves as the lens through which experimental and observational results are interpreted. Despite the primacy of metaphysics with regard to empirical data, the generality of Descartes' principles removes the possibility of this primacy being used to explain Descartes' frequent acceptance/rejection of data. Instead, a better explanation would be that he inconsistently incorporated those reports based on a variety of factors that would not be useful to elaborate upon—the absence of method in this regard being my only point. Given the overly general nature of Descartes' principles, I have shown that while he explicitly endorses crucial experiments in the *Discourse*, we only have concrete examples of him using these as a mode of attack, and almost never turns them inward. However, far from only using experiment and observation only as a weapon, we must take Descartes as holding a dual purpose for the empirical side of his natural philosophy. First, as is commonly accepted, experimentation was used a method of discovery—it pointed to unknown properties of the material world and revealed interesting effects that warranted explanation. Beyond this, however, the unity of Descartes' system also entails that each experiment played a verification role as well. Each new phenomena that could be discovered through experiment and explained via

Descartes' natural philosophy lent credibility to the overarching hypothesis that all of the natural world could be explained by size, shape, and motion.

CHAPTER THREE:
THE PHYSICS OF DESCARTES' ETHICS

I. Introduction

The study of Descartes' ethical theory produces several problems of interpretation. We must address, for example, the very basic problem of where to look for the core of his theory. Descartes left no treatise on ethics or any substantial discussion of ethics in his published work, which in part explains the sparse commentary on the subject and Descartes' limited reputation as an ethicist. Traditionally, the primary discussion of Descartes' moral thought centers on his correspondence with Princess Elisabeth and Queen Christina (with some input from Pierre Chanut). However, upon closer examination there is a great deal of ethical content elsewhere in his corpus, most notably in the *Passions of the Soul* (hereafter *Passions*), which is informed and partially derived from this correspondence.¹¹⁰ Yet, the *Passions*, far from a derivative work, adds considerably to the correspondence and, as I will argue, gives us a clearer vantage point to view the full scope of his ethical theory. Of course this is not a radical claim—commentators have often focused their discussions on the overtly ethical language used in certain sections of the *Passions*. However, viewing the *Passions* under a primarily ethical lens is not without its own unique set of problems, which have often been overlooked. Perhaps the most obvious difficulty comes very early on in the *Passions*

¹¹⁰ There are, of course, other works where we can look. Apart from the *Discourse on Method*, which will be discussed later, Shapiro (2008) finds some very convincing traces in the *Meditations*.

when Descartes describes his own project: “My plan was not to explain the passions as an Orator, nor even as a moral philosopher, but merely as a physicist.”¹¹¹ In this regard, it might seem a bit odd that many commentators have looked for insight into Descartes’ ethical theory in the *Passions*—exactly where he denies giving any at all. However, taking Descartes seriously in viewing the *Passions* as primarily written qua physicist does not necessarily exclude a robust connection with his broader ethical project. In fact, given Descartes’ frequent claims of general continuity throughout his philosophic system—morals and physics included—we might expect such a connection almost anywhere in his corpus. This claim is most prominently expressed in Descartes oft-cited tree analogy in the preface to the French edition of his *Principles of Philosophy*. In the analogy Descartes compares the roots of a tree to metaphysics, its trunk to physics, and the various branches to specific practical fields of science that yield “fruit.” According to this analogy, the most perfect morality depends on the tree as a whole, and therefore, requires the knowledge of all other sciences.¹¹² This claim occurs again in a letter to Chanut where Descartes asserts, “truths of Physics are part of the foundation of the highest and most perfect morality.”¹¹³ At times, Descartes even claimed that his studies pertaining to physics had a direct role in advancing his moral thinking.¹¹⁴

¹¹¹ “[M]on dessein n’a pas esté d’expliquer les Passions en Orateur, ny mesme en Philosophe moral, mais seulement en Physicien” (AT XI, 326). This passage has been widely debated in commentary on the passions. Translation of this passage has also been contested. Cottingham, Stoothoff, Murdoch and Kenny translate “physicien” as natural philosopher, while Nancy Struever insists, as will be discussed later, that a better translation would be physician. I have chosen to translate it here simply as “physicist” to emphasize Descartes’ insistence on separating himself from those who came before him, who did write as natural philosophers and physicians.

¹¹² AT IXb, 14.

¹¹³ AT V, 291; CSMK, 368.

¹¹⁴ See Descartes to Elisabeth (AT IV, 291-292; CSMK, 265-266) and again to Pierre Chanut, May 1646 (AT IV, 441). However, one might well question Descartes’ sincerity

This chapter begins an analysis of Descartes as a moral thinker informed by his physics and explores avenues where the *Passions* can neatly fit within such a project. To start plotting out a course, I will first look at Descartes' provisional moral code and his correspondence with Elisabeth and Christina—two areas traditionally seen as the backbone of his ethics. First, I will be highlighting areas of these exchanges that bring the tension in associating Cartesian physics with ethics into full relief. Second, I will try to isolate Descartes' considered view in his correspondence and use this as a test case for any connection to his physics. Following this, I will move toward the *Passions of the Soul* by filling in surrounding context, in hopes of showing that my own interpretation of Descartes has some historically relevant precedence. Ultimately, in the last section of this chapter, I will conclude that even Descartes' ethics is subject to a two-fold methodology, which includes the need for empirical testing and observation.

II. Provisional Code—Just how Provisional?

To establish the core of Descartes' ethical theory, I will begin by generally tracing some of the broad outlines of context surrounding Descartes moral thought chronologically. As is well known, Descartes was at first fairly hesitant to make his moral theorizing public.¹¹⁵ Despite this reluctance, his first major publication, the *Discourse on Method*, includes what he termed a “provisional morality.” This initial foray into ethical theorizing is remarkably straightforward and succinct—composed of

here, as it may well be the case that he was simply attempting to drum up interest in his *Principles*, which he was sending to Chanut, who was clearly more interested in ethical matters than physics.

¹¹⁵ Descartes gives various reasons for wanting to refrain from writing on morals. At one point he claims he fears a potentially dangerous reception, while later he claims that only sovereigns should trouble themselves with such a study, thus he has no obligation to publish anything for the common person (AT IV, 536; CSMK 299:AT V, 87; CSMK, 326).

“just three or four maxims.”¹¹⁶ In his first rule, he submits himself to the laws and customs of the country he lives in, along with its religion. In the second, he decides “to be as firm and decisive in my actions as I could, and to follow even the most doubtful opinions, once I had adopted them, with no less constancy than if they had been quite certain.”¹¹⁷ For his third maxim, he takes on the stoic doctrine: “to try always to master myself rather than fortune, and change my desires rather than the order of the world.”¹¹⁸ There is a fourth rule, which states that one should survey all the professions and choose the best, although the status of this rule is somewhat questionable for two reasons. First, as already stated, there might only be three maxims which casts doubt on the status of at least one of the rules.¹¹⁹ Second, as we will see later on, this fourth maxim disappears from later versions of the provisional code.

The objectives of the provisional moral code explain why Descartes includes it, despite being generally reluctant to enter into moral discussion. First, and most superficially, Descartes’ states his goal of a provisional code. His project is a complete overhaul of philosophy. But given Descartes understands philosophy as a field of study that guides life, without any immediate replacement, he would be left with no method to go about his day-to-day business or research. As Descartes simply puts, “before starting to rebuild your house,¹²⁰ it is not enough to simply pull it down...you must also provide

¹¹⁶ Of course, claiming that his code is made up of “just three *or four* maxims” already adds significant ambiguity (AT IV, 22; CSM I, 122. *Emphasis added*). However, I will be focusing only on the first three, which will be repeated elsewhere in Descartes’ corpus, while the “fourth” maxim is never brought up again.

¹¹⁷ AT VI, 24; CSM I, 123.

¹¹⁸ AT VI, 25; CSM I, 123.

¹¹⁹ AT VI, 22; CSM I, 122 (*emphasis added*).

¹²⁰ The metaphor of a house seems to be fairly important for Descartes and he returns to it later in his *Meditations*. See Flage and Bonnen (1999, p. 6-9) for a more detailed discussion of how this metaphor is filled in.

yourself with some other place where you can live.”¹²¹ However, this moral code does serve a second objective; namely, to serve as a preemptive rebuttal to objections regarding his use of the method of doubt. Descartes announces just this intention in a letter to Reneri for Pollot.

Finally, I was forced to speak of firmness and resolution in action for the sake of ease of conscience and to prevent people from blaming me for saying that in order to avoid rashness we must once in our lifetime put aside all the opinions we have hitherto believed. Otherwise it seemed that people would have objected that such a universal doubt could give rise to great indecision and moral chaos.¹²²

Thus, Descartes brushes aside the basic objection to skepticism. While doubt leads to indecision and inaction, a simple acknowledgement of the basic demands of life will not permit anyone such a luxury.¹²³

With the provisional moral code, we see a very simple version of Descartes’ means for existing without conflict. He avoids the Pyrrhonian pitfalls of inaction and permanent doubt, while he completes his philosophic and scientific system. Yet, there is notably no mention of virtue or vice, blameworthiness, praiseworthiness, or any real normative or objective element. The provisional code is explicitly introduced as a *personal* code, presented as a mere observation of how Descartes leads his own life. It becomes abundantly clear that Descartes never intended this code to be “the highest and

¹²¹ AT VI, 22; CSM I, 122.

¹²² AT II, 35; CSMK 97. This quite emphatically argued for by Nicolas-Joseph Poisson in his 1670 *Commentaire ou Remarque sur la method de René Descartes*, where despite Descartes’ own claims on the matter, Poisson still feels the need to defend against charges paralysis brought about by skepticism (p. 98-105).

¹²³ Even though Descartes makes multiple attempts to preemptively defend himself against the charge of taking skepticism too seriously, these allegations follow him throughout his career. See Verbeek’s excellent book, *Descartes and the Dutch*, for a detailed account of some of these accusations in the Dutch context.

most perfect morality.” When speaking of the second rule of the provisional code, again in the letter to Reneri for Pollot, “I apply this rule mainly to actions in life which admit of no delay, and I use it only provisionally, intending to change my opinions as soon as I can find better, and to lose no opportunity of looking for them.”¹²⁴ While directly asserting this only for the second maxim, it seems clear that the observation holds generally for the entire provisional moral code, given its stated purpose. Despite its explicit provisional status and his active enquiry to find better, Descartes’ returns to this moral code eight years later in a letter to Princess Elisabeth, giving it a fairly surprising amount of staying power. This eight year span alone seems to lend credence to some commentators’ belief that the provisional morality, after serving its purpose of sustaining Descartes during initial research, is eventually solidified into at least part of his definitive moral system.¹²⁵

There are further reasons to believe that Descartes’ provisional morality does indeed have enough staying power to become part of his definitive morality. First, the purpose of the provisional morality, as Descartes claims, was to give him a means to conduct day-to-day life as he completes his metaphysical and physical systems. By 1644 Descartes had published the Latin version of his most ambitious work, the *Principles of Philosophy*. The *Principles*, containing both a basic overview of his metaphysical thought along with his physics, should give us reason to believe that Descartes was finally in a suitable position to competently complete a moral system—or at least no

¹²⁴ AT II, 35; CSMK 97. A similar sentiment is expressed in the preface to the French translation of the *Principles*, AT IX, 13; CSM I, 186.

¹²⁵ See Shapiro (2008), Marshall (1998), Le Doeuff (1980) as prime exemplars of this type of view, and to a lesser extent, Gilby (2011), who softens Le Doeuff’s thesis that Descartes’ claim that *par provision* is a legal phrase roughly equivalent to a “down payment.”

longer fear being without shelter.¹²⁶ Thus, it is telling when we see Descartes return to the provisional moral code in a letter to Princess Elisabeth in August of 1645, well after the *Principles* is completed. It is important to note, however, that the provisional moral code is *returned to* but not *repeated*. In the second iteration there are some significant changes. Descartes' first maxim of the provisional code in the *Discourse*—to follow the customs and laws of one's country—is noticeably absent.¹²⁷ Instead we are given a new first rule: “[one] should always try to employ his mind as well as he can to discover what he should or should not do in all circumstances of life.”¹²⁸ Immediately this highlights a substantially different tone for Elisabeth than for the general audience of *Discourse*.¹²⁹ The need for practicality and immediate use, so prevalent in the *Discourse*, has all but disappeared. It's replaced with an emphasis on discovery. At this point, we might posit that the difference could reflect Descartes tailoring the presentation of his ethics to Elisabeth, specifically keeping in mind her political standing. It would be quite strange to instruct a member of royalty to follow the customs of one's land.¹³⁰ While this interpretation might hold for the first maxim, changes to the following rules are inconsistent with such a simple reading.

¹²⁶ However, Descartes does admit that his physics is not yet completed. He claims that he originally planned two additional parts to the *Principles*: one on living things, and another on man (AT IX, 310; CSM I, 279).

¹²⁷ This is not to say that Descartes has completely disregarded this maxim. It is brought up shortly after in a later letter to Elisabeth, dated 15 September 1645 (AT IV, 295; CSMK, 267).

¹²⁸ AT IV, 253; CSMK, 257.

¹²⁹ The *Discourse* was originally written in French, and thus meant for a broader audience than Descartes' later Latin works.

¹³⁰ Descartes does seem to believe that sovereigns have a different relationship with ethical study than the commoner (AT V, 87; CSMK, 326). Another factor to consider is the private nature of the correspondence. While Descartes' side of the conversation was published in Clerselier's first edition of Descartes' letters, Elisabeth's responses were not published for some time. However, despite this, Elisabeth did serve as a patron and promoter of Cartesian philosophy (Bos, 2010).

The second maxim also differs considerably from its original form in the *Discourse*. In its earlier form, Descartes decides to, “be as firm and decisive in my actions as I could, and to follow even the most doubtful opinions, once I had adopted them.”¹³¹ Later, to Elisabeth, the “doubtful opinions” are omitted. Instead, we are told to “have a firm and constant resolution to carry out whatever reason recommends.”¹³² Again, we see the provisional elements removed, replaced with the certainty that reason confers.

Whereas the first two maxims of the *Discourse* are subjected to extensive revision in the letters to Elisabeth, the third maxim’s changes are subtle. In the *Discourse*, we are told to conquer ourselves rather than fortune, but in the letter to Elisabeth, things outside our power are not to be desired. Thoughts, being the only thing wholly within our control, become the central focus of our lives. However, it should be noted that while most changes to the third maxim seem to be minor or even stylistic, Descartes is careful to insert a dependence of this slightly revised third rule on the other two aforementioned rules. We are led to the third rule, Descartes claims, by conducting ourselves in accordance with the previous two. This leaves us assured that by following reason and being firm in our judgments, no good not already in our possession is outside of our control and, therefore, not worthy of our concern.¹³³

As mentioned above, while there is little doubt that the provisional morality of the *Discourse* was destined for replacement, we need to seriously consider whether the rules given to Elisabeth were meant to be the better rules Descartes had claimed to be looking for. Descartes own understanding of the relationship between the later rules

¹³¹ AT VI, 24; CSM I, 123.

¹³² AT IV, 265; CSMK, 257.

¹³³ AT IV, 266; CSMK, 258.

given to Elisabeth and the provisional code of the *Discourse* is less than clear. In introducing the rules to Elisabeth, Descartes makes an unusually cryptic claim.

Or il me semble qu'un chacun se peut rendre content de soi meme et sans rien attendre d'ailleurs, pourvu seulement qu'il observe trois choses, *auxquelles se rapportent les trois regles de morale*, qu j'ai mises dans le Discours de la Methode.¹³⁴

What is of particular interest here is Descartes claim that the three rules to Elisabeth “auxquelles se rapportent les trois regles de morale.” CSMK translates this key phrase as, “which are related to the three rules of morality.” However, this translation may not be the most precise. We could also, perhaps more accurately, translate this sentence as, “to which the three rules of morality are related,” thus reversing the direction of the relationship. While the translation in CSMK seems to imply that the rules to Elisabeth emerged from the provisional code of the *Discourse*, we might just as well say that the provisional code emerged from the rules to Elisabeth. This later interpretation would give an interesting insight into how seriously and for how long Descartes had been taken by his own moral code. The text, however, is simply too ambiguous and scant to determine exactly how we should read Descartes’ own account of the relationship between the two differing sets of rules. I believe that the revisions, along with Descartes’ explicit acknowledgement that they are related but not identical to the first provisional code, gives us good cause to accept the second iteration to Elisabeth as part of his considered view. We will also see later on that elements of this second code reappear in

¹³⁴ It seems to me that each person can make himself content by himself without any external assistance, provided he respects three conditions, which are related to the three rules of morality which I put forward in the *Discourse on Method* (AT IV, 265; CSMK, 257)(emphasis added).

the *Passions*, further bolstering the argument that we should take the second version of the provisional code as permanent.

III. The Problem: The Purely Mental Nature of Descartes' Ethics

Accepting that the provisional ethical code has taken on a more permanent nature by August of 1645 does not necessarily entail that it is remotely close to the “highest and most perfect morality;” instead, we should take it as a necessary component. The method, therefore, can be to take the code presented to Elisabeth as part of Descartes' considered view and use it as a test case to square this position with Descartes repeated claims that his physics informs the foundation his ethics. In other words, if we can connect the second iteration of the provisional code somehow with Descartes' physics, we are on good footing to indicate how Descartes envisioned the interconnectedness of his natural philosophy. However, the connection is less than clear. Even if we were to take the earlier code of the *Discourse*, there is no more obvious avenue to connect them directly to his physics. Both of Descartes' sets of rules seem to be exclusively concerned with either the will or the intellect, which neatly exclude any direct connection with Cartesian physics, since those are faculties that clearly fall exclusively under the mind's purview.¹³⁵

We might attempt to forge a connection by noting that the nature of the will and intellect are discovered through Descartes' metaphysics and epistemology. These two branches of Cartesian natural philosophy in turn serve as the grounding for his physics, thus indirectly connecting physics to ethics. However, this interpretation simply does not get the intended dependence between physics and ethics aligned in the correct

¹³⁵ There are other faculties, however, that have both a mental and physical element—memory and imagination, for example, require the brain as well as the mind.

manner. If we take this route, morals have simply circumvented his physics and are neither dependent nor informed by it. Instead, morals are simply formed by some of the same core principles. In short, under this reading we could maintain metaphysics, cut out physics all together, and not suffer any loss. On the other hand, we might attempt to bridge the gap between the metaphysical foundation of his ethics and the material aspect of his physics through the third rule of the provisional code, which instructs us to not desire things outside of our control. Here there might be a hidden implication that refers back to knowledge of Cartesian physics, insofar as his physics would be able to help us delimit how much of the physical realm is within our control.

Yet even this modest hypothesis seems to be directly contradicted by Descartes himself. From the *Discourse* we can gather that it is only our thoughts that are completely within our control—something that seems entirely consistent with the general stoic theme running throughout most of Descartes’ moral musings.¹³⁶ While we might do our best to obtain those things external to us, Descartes position is that they should be subject to chance more than our will, and consequently, we should stoically resist desiring them.

The scope of what is within our control is further refined in the *Passions of the Soul*. Instead of the broad category of *our thoughts* being the only thing within our control, Descartes clarifies that it is exclusively our *will*.¹³⁷ This reinforces our initial problem. The will, a faculty entirely contained by the immaterial mind and thus the

¹³⁶ AT VI, 25; CSM I, 123.

¹³⁷ AT XI, 446; CSM I, 384. It is, however, if we are being charitable, it is likely that Descartes never held that all thoughts were under our control, as implied in the *Discourse*, but instead only a subset. Later, in the *Principles*, we can see a distinction between two types of thoughts, those within our control, and those outside of it (AT IX, 64; CSM I, 223). This distinction becomes important in establishing the reality of external objects via God qua non-deceiver in the *Meditations* as well.

subject of metaphysics, lends little room for any connection with the physical (i.e. the realm of physics). Elisabeth herself is quick to point out the intellectualist character of Descartes' morals, which she seems to take as independent of the body when considering the nature of happiness.

The immortality of the soul, and knowing that it is much more noble than the body, is capable of making us seek out death, as well as it can make us despise it, because we would not know how to doubt that we will live more happily, excepted from sicknesses and passions of the body.¹³⁸

Here Elisabeth is rightly keying in on Descartes' lack of reference to the body, external objects, or the physical world in general, as playing any role at all in human happiness.¹³⁹ Indeed, the third rule of Descartes' morality seems to expressly exclude such a role. Descartes' response to this powerful objection equally fails to make any such connection. Instead of relating happiness and his moral system to the world, he gives a relatively unimaginative skeptical argument: we have no reason to think that the next life is better than our own, and no real reason to believe that the world we actually inhabit is in fact bad. Descartes goes even further to marginalize happiness to the mind in claiming, "true philosophy, on the contrary, teaches that even amid the saddest disasters and most bitter pains we can always be happy [*content*], provided that we know how to use our reason."¹⁴⁰ The reduction of happiness, and therefore morals, to the realm of the spiritual (i.e., the mind) seems to be complete.

¹³⁸ AT IV, 302.

¹³⁹ A similar argument is found in Elisabeth's letter to Descartes from 18 October 1645 (AT IV, 323).

¹⁴⁰ AT IV, 315; CSMK, 272.

The separation of the mind from bodily needs and discomforts is, of course, nothing new in the history of philosophy. Stoic philosophers have long advocated a very similar position and Descartes was familiar with and influenced by at least some of the great stoic thinkers.¹⁴¹ However, if this is to be Descartes' position as an ethical thinker, there would be no way to connect this train of thought to his often repeated claim that his ultimate ethical theory will depend on his physics. This has led most commentators to assume either, that the purported connection between ethics and physics was simply typical bluster from a philosopher who was not exactly prone to modesty, or none of Descartes' ethical writings should be considered as his actual theory.¹⁴²

There is one other possible interpretation that deserves mention. In a letter to Elisabeth, Descartes gives us what could be a solution to our problem.¹⁴³

It may be useful to judge worthily of the works of God and to have a vast idea of the extent of the universe, such as I tried to convey in the third book of my *Principles*. For if we imagine that beyond the heavens there is nothing but imaginary spaces, and that all the heavens are made only for the service of the earth, and the earth only for man, we will be inclined to think that this earth is our principal abode and this life our best. Instead of discovering the perfection that are truly within us, we will attribute to other creatures imperfections which they do not possess, so as to raise ourselves above them, and we will be so

¹⁴¹ Deborah Brown, in her book *Descartes and the Passionate Mind*, argues that Descartes is situated between two traditions: Aristotelianism and Stoicism. While I do not disagree with her conclusion here, I will argue that these traditions are not the exclusive influences, or necessarily the most important ones. As will become clear, we need to look more broadly to the medical tradition to be able to explain large portions of the *Passions*.

¹⁴² See Morgan (1994, p. 24-25).

¹⁴³ Shapiro (2008, p. 456-457) seems to make just such a connection.

absurdly presumptuous as to wish to be long to God's council...and this will bring us countless vain anxieties and troubles.

Here Descartes seems to be suggesting that through contemplation of the world and the laws that govern it, we gain some humility. In short, through the study of physics we can potentially become more ethical beings.

I would like to caution against such a direct connection between Cartesian ethics and physics for two reasons. First, Descartes only says that it *might* be useful, whereas when discussing the most perfect ethics he claims that the connection would assume knowledge of physics. Second, when we look back toward the tree of philosophy analogy from the *Principles*, Descartes not only says that the most perfect ethics would require physics and metaphysics, but also a knowledge of *all* the other sciences—mechanics and medicine being the principal ones. Thus even if this passage were to connect a small portion of Descartes' physics to ethical contemplation, it still has not satisfied the further condition of connecting medicine and mechanics.

IV. Beginning to Bridge the Gap: The *Passions* and Descartes the Doctor

To address this apparent tension, we should turn now to the *Passions* as a possible bridge stretching from physics to ethics and examine exactly how this fits into the general philosophic project laid out so neatly in the tree of philosophy analogy of the *Principles*. When looking at the *Passions*, the significant amount of attention Descartes pays to the bodily processes that accompany the mental phenomena of the passions is immediately apparent. The work is filled with descriptions of various changes in the circulation of blood, movements of the heart, and skin coloration, among many other physiological observations. In this regard, it is necessary to not only view the *Passions*

written by a philosopher, but also as one that is written as physician. Many of these descriptions come from Descartes' own experiments, dissections, and observations, all of which indicate an enduring interest in medicine. As early as 1630, seven years before the first publication of the *Discourse*, Descartes writes to Marin Mersenne, informing him of his recent studies in anatomy and pathology.¹⁴⁴ Indeed, there are times when Descartes claims the pursuit of medicine as his primary goal.¹⁴⁵ Of course, Descartes' interest in medicine is not completely selfless, as he initially was concerned with prolonging his own life indefinitely—although he slowly lowers his aspirations on this front over his career. Several excellent commentators have stressed the fact that Descartes' interest and skill in medicine was neither a passing phase nor ignored by his contemporaries—he was, after all, invited to take up the chair in theoretical medicine at the University of Bologna, even before the *Discourse* was published.¹⁴⁶ Descartes' closest allies were also keenly aware of his dedication to the study of medicine. In Clerselier's first edition of Descartes' letters, for example, he chose to emphasize a selection of letters on the topic to further promote Descartes' legacy.

Whether or not Descartes had any formal training in medicine is unknown.

However, throughout his career he often offers advice to his correspondents on matters

¹⁴⁴ AT I, 137.

¹⁴⁵ In the *Discourse on Method* Descartes announced his plan to, “devote the rest of my life to nothing other than trying to acquire some knowledge of nature which we may derive rules in medicine” (AT VI, 78; CSM I, 151). Later, in a 1645 letter to the Marquess of Newcastle, he states that, “the preservation of health has always been the principal end of my studies” (AT IV, 329; CSMK, 275).

¹⁴⁶ While not much is known about how Descartes' name came up for consideration for the chair, or even if he received the offer at all, the most information can be found in Manning (2014). Vincent Aucante also makes an excellent case for Descartes' enduring passion for medicine, even claiming that 20% of Descartes' extant corpus is medical in nature.

of health¹⁴⁷ and regularly warns his friends of the quackery common among the physicians of the day.¹⁴⁸ He also warns of the dangers of blood-letting, among other such “remedies.”¹⁴⁹ While Descartes derides the uninformed and unsuccessful practices of physicians, and instead counsels that one’s own experience should be trusted over authority.

I share the opinion of Tiberius, who was inclined to think that everyone over thirty had enough experience of what was harmful or beneficial to be his own doctor. Indeed it seems to me that anybody who has any intelligence, and who is willing to pay a little attention to his health, can better observe what is beneficial to it than the most learned doctors.¹⁵⁰

Descartes further claims, in the preface to the *Description of the Human Body* that, “there is no more fruitful exercise than attempting to know ourselves.”¹⁵¹ However, while Descartes expressly claims to be his own teacher regarding medicine, he was not completely ignorant of medical studies. Descartes had read Jean Fernel, who we will discuss later; he was, famously, an early advocate of Harvey and the circulation of the blood; and even studied such seemingly esoteric subjects as chicken embryology as early as 1631.¹⁵² Yet, despite his open contempt for the status of medicine in his day, Steven

¹⁴⁷ See AT IV, 565 and AT IV, 588 for two excellent examples of Descartes’ medical advice to Clerselier and Princess Elisabeth.

¹⁴⁸ This was a fairly common criticism of the day, see Pender (2006).

¹⁴⁹ AT IV, 588.

¹⁵⁰ AT IV, 329-330; CSMK, 275-276 and again later in the *Conversation with Burman*, 51.

¹⁵¹ AT XI, 223; CSM I, 314.

¹⁵² Descartes claims in 1646 to have read *De formatione ovi et pulli* 15 years prior (AT IV, 555).

Shapin points out that most of the medical advice that Descartes gives to his correspondents could be commonly found in the works of Galenic physicians.¹⁵³

It will hopefully become clear throughout the remaining sections that this intense interest in medicine, broadly construed, cannot be removed from the context of the *Passions*, neither can it be removed from the context of Descartes' ethical theorizing.¹⁵⁴ With all this in mind, I will defend two claims. First, that the *Passions* is a work almost exclusively concerned with the bodily, thus we cannot easily view it as ethical work that neatly fits in Descartes' framework as we have discussed. In this way, the *Passions* is more a medical work than anything else. Second, I will contend that the medical in Descartes' corpus represents a different type of ethical theory—one where experimental, observational, and anatomical study are all relevant—thus, we can reconnect the *Passions* with his ethics, albeit in a non-traditional way. In essence, my claim is that Descartes engages in creating an ethical system for the mind-body union, not just the mind.

While traditionally the *Passions* is treated solely as an ethical treatise, insisting that the *Passions* be viewed primarily as a medical work is not entirely novel. For example, Nancy Struever has suggested making a direct connection between the *Passions* and medicine by translating Descartes' own claim to be writing as a "*physicien*" as a "physician."¹⁵⁵ I have been unable to find a period dictionary that would

¹⁵³ Shapin (2000, 149).

¹⁵⁴ The connection between modern natural philosophy and medicine is only now beginning to be appreciated. See Smith (2016) for an excellent defense of why medical views should be seen as philosophically relevant in cases like Descartes and Leibniz.

¹⁵⁵ Struever (1993, p. 197).

help substantiate this translation, but it is not completely without merit.¹⁵⁶ During Descartes' time, although it varied greatly by country, it was not uncommon first to receive an education in natural philosophy before continuing on to medicine.¹⁵⁷ Physicians were often expected to have some knowledge of the physics of the day, and in essence, physics was indeed part and parcel of medicine. Yet, this alone is not enough to fully substantiate the reading I would like to pursue.

On this subject, two remarks should be made. First, even though physics was part of medical pedagogy during the time, Descartes did not see himself as part of that tradition, and he was all too eager to distance himself from the perceived quackery around him. This is evidenced by his frequent derision of medical doctors and his claim that the *Passions* was breaking ground in a new direction. Compared to his predecessors, Descartes believed he was connecting physics to the *Passions* in an utterly novel manner.¹⁵⁸ Secondly, we need to recognize that what Descartes considered physics to be, under a broadly mechanical worldview, was often at odds with the scholastic physics that would have been taught to medical doctors. Thus when Descartes insists he is speaking qua *physician*, we need to be considering something intended to be significantly different from the traditional physics taught in his day. In short insisting

¹⁵⁶ However, in the 1694 edition of the *Dictionnaire de l'académie française*, "physician" is defined as "one who knows physics [*la physique*];" later physics [*physique*] is defined as knowledge of natural things with a telling example given, "physics [*la physique*] is necessary for the physician [*médecin*]."

¹⁵⁷ See Brockliss' *French Higher Education in the Seventeenth and Eighteenth Centuries: A Cultural History*.

¹⁵⁸ "The defects of the sciences we have from the ancients are nowhere more apparent than in their writings on the passions...That is why I shall be obliged to write just as if I were considering a topic that no one had dealt with before me (AT XI, 327-328; CSM I, 328).

that Descartes was writing as a physician is simply forcing him into a context that he was explicitly trying to reject.

On the other hand, before discounting the ethical content normally supposed in *Passions*, we should first outline the problems of such a reading. A great deal of recent literature on the *Passions* has focused primarily on the scant portions dealing with ethical language, to the detriment of a fuller understanding of the exact role the copious amounts of physiological observations play. This emphasis on the ethical has even led some to almost entirely disregard any of the physiological remarks. For example, Lisa Shapiro goes so far as to express that Descartes simply spends an “inordinate amount of time detailing the physiology of the passions.”¹⁵⁹ However, I will argue that if we take a closer look at the context surrounding Descartes’ *Passions*, we can see that the physiological comments play a central role to a project that is embedded in the context of similar treatises on the passions of his day. Further, I will argue that without the physiological underpinnings, Descartes’ theory of the *Passions* as a *practical* science is left incomplete and lacking any substantial connection to his physics.¹⁶⁰

V. Two Cases to Guide an Interpretation: Juan-Luis Vives and Jean Fernal

It is easy to understand Shapiro’s complaint regarding the voluminous nature of Descartes’ physiological comments; at times, they can seem repetitive, are often completely false, and do not neatly fit the mold of stoic treatises on passions that

¹⁵⁹ Shapiro (2003, p. 50).

¹⁶⁰ Descartes most clearly expresses that all sciences after metaphysics and physics will be useful and have some particular end in his often quoted tree analogy in the preface to the French version of the *Principles* (AT IX, 14).

typically come to mind when considering the topic.¹⁶¹ From this angle, Descartes' work begins to look like a disjointed anomaly or a treatise without a context. However, to justify my interpretation and begin to adjust the lens through which we view the *Passions*, I propose setting two distinct stakes in the ground to orient my interpretation; namely, the works of Juan-Luis Vives, and Jean Fernel. These two authors are important for this discussion for two reasons. First, it is known that Descartes had read both of these authors and there is no question that they had a degree of influence of him. Vives is one of the very few authors explicitly cited in the *Passions*, while Fernel is mentioned in Descartes' correspondence as an important authority in areas of medicine. Fernel's reputation is held in such high regard that Descartes claims him as, "an authority that can be used in opposition to other authorities."¹⁶² The second reason to consider these thinkers is that they highlight just how diverse of a subject the passions of the soul were during Descartes' time and the scope of his own depth of knowledge on the subject. Fernel, for example, was a 16th century doctor who wrote extensively on physiology, pathology, the treatment of illnesses, as well as on the different types of souls and their corresponding passions. In contrast, Vives was a Spanish-born, 16th century humanist, whose work dealt primarily with metaphysics and morals. While these two authors come from wildly different backgrounds and deal with very dissimilar subjects, they do share some overlap with regards to the passions. This overlap will in turn help justify the reading I would like to give of Descartes' ethical work, showing that this avenue was both open, well-trodden.

¹⁶¹ See Rutherford (2004) and Shapiro (2008).

¹⁶² Descartes to Plempius, 15 February 1638 (AT I, 533). We know from this same letter that Descartes certainly read Fernel's *Pathology*, but it is likely he read his other works, as they were widely circulated at the time.

i. Vives

To move chronologically, we can begin with Vives, whose primary discussion of the passions of the soul comes in the third book of *De Anima et Vita* titled *Passions of the Soul*, published in 1538. Unlike many thinkers dealing with the passions, including Descartes himself, Vives does not offer any precise taxonomy of the passions and his discussion on this topic can seem rather disorderly and fragmented at times. However, Vives offers unusual clarity in presenting the goal for a detailed study of the passions, claiming it is “necessary for remedying grave evils and providing medication for severe diseases.”¹⁶³ The moral overtones, while ambiguous in the stated goal, are quite hard to miss later in the book—after all, while the first half of book three is dedicated to a study of the passions as they contribute to our humanity, the second half is entirely dedicated to treating the passions in man as “a dreadful and cruel beast.”¹⁶⁴

For Vives, the passions are defined as being our natural faculties, given by God, that serve to help us seek out good and avoid evil. Thus, the passions perform a definite function; yet, we are warned they provide only practical information as to how we view the world, not how the world truly is. Much like we see in Descartes, the intellect is needed to regulate information from the passions. Furthering the vital role of the passions, Vives even goes so far as to claim explicitly against the Stoics that the possession of certain passions is what makes us human and is necessary for living a moral life. For example, when speaking of the possibility of living without sympathy Vives vehemently retorts, “this is not only impossible but completely inhuman, since

¹⁶³ Vives (1989, p. 1). Disease is most likely not referring to a physical disease. Instead Vives speaks of diseases of the soul as affections reinforced by experience. (p. 5)

¹⁶⁴ Vives (1989, p. 60).

compassion is born from the similarity and affinity between human souls.”¹⁶⁵ Further developing this “similarity and affinity,” Vives defines sympathy and love as having two characteristics. First, we feel love or sympathy for others because we see similarities between the objects of love and ourselves—indeed, we see others we love as extensions of ourselves.¹⁶⁶ Second, because they are seen as part of ourselves, love and sympathy serve as internal motivations toward benevolent actions toward them, albeit quasi-egotistical benevolence.¹⁶⁷

It is clear in Vives’ treatment of the passions that some of them are to be valued as useful and informative emotions but only when properly moderated (even love needs to be resisted to some degree from an early age). In contrast, some passions such as sadness, fear, and pride, are entirely negative and always to be avoided. Vives’ discussion of the origin of passions and appropriate therapy to moderate them is significantly less clear, although he does offer some advice, which we will discuss later. Interestingly, and like Descartes, Vives often intermingles physiological comments within his discussion of the passions; however, there is no clear methodology for when he finds physiological observations pertinent. Sadness, for example, is claimed to cause black bile, dry up the body, and contract the heart. The effect of this black bile in turn is to “darken our minds” and make our souls lifeless.¹⁶⁸ Similarly, anger is discussed in terms of blood, heat, and its negative effects on the body.¹⁶⁹ In contrast, pleasure is

¹⁶⁵ Vives (1989, p.47).

¹⁶⁶ In this regard, Vives seems to be paralleling Aristotle’s views on friendship.

¹⁶⁷ There seem to be strong parallels here to Descartes’ own theory of love, which describes it as one considering himself “from the present as joined with what we love.” For a more complete account of some of the background of Descartes’ theory of love, see Frigo (2016).

¹⁶⁸ Vives (1989, p. 94-95).

¹⁶⁹ Vives (1989, p. 68).

defined solely in terms of the contentment of the will with its proper good.¹⁷⁰ While there is no clear demarcation between physical passions and non-physical passions, they each have different ends: the former is important for achieving bodily harmony, while the latter is important for achieving spiritual harmony. Both of these aspects ultimately make up a moral being for Vives.

ii. Fernel

In his work entitled *Pathology*, Fernel begins his discussions of the passions with a much more obviously medical bent. He begins with the overtly pessimistic claim that because the passions can never be truly conquered, they must be seen as evident and necessary causes of sicknesses.¹⁷¹ As a medical doctor, it is clear that much of Fernel's interest in the passions is centered on treating the passions as both the causes and outward signs of human illness. Unlike Vives, who dealt with physiological matters only sporadically, Fernel is consistent in focusing on the bodily effects and causes of the passions. On this note, all the passions have a negative role in one's health and should be avoided as much as possible—as we will see later, Descartes agrees with the passions playing a role in one's health, but firmly denies that they are wholly negative. Fernel's position is fairly unique, relative to these three thinkers, as even moderated passions play no positive role for one's health and are to be categorically avoided.¹⁷² The lone exception to this is joy, which is said to dilate the heart, and is only sometimes beneficial to one's health.¹⁷³

Fernel is also significantly more methodical than Vives in his classification of the

¹⁷⁰ Vives (1989, p. 52).

¹⁷¹ Fernel (1646, p. 68).

¹⁷² Fernel (1646, p. 68).

¹⁷³ Fernel (1646, p. 68).

passions. While, like Vives, Fernel does not adopt the standard scholastic division of the passions into concupiscible and irascible, he does include a basic taxonomy of primitive passions: fear, sadness, anger, joy, shame, and anxiety.¹⁷⁴ All other passions are derivative of these basic six. Fernel also provides a means of systematically addressing immoderate passions. According to Fernel, passions are classified as appetites that do not involve the use of reason and have a natural seat in the body itself. Among the irrational appetites, not considered as passions, are violent desires, whose seats are in the liver, testicles, and stomach; while the passions proper have a seat in the heart. Fernel's evidence for the physical location of violent desires and the passions comes from diagnosing disorders that are associated with them. For example, when one is in the throes of rage, Fernel claims the heart is noticeably oppressed. Because the seat of these passions is in the body, the remedy for the passions is simply a physical treatment of the heart. Thus, immoderate passions receive similar physical treatment as any other physical ailment. For example, fear, melancholy, and sadness, can be alleviated with a particular type of apple juice, which he claims helps to remove palpitations in the heart.¹⁷⁵ Furthering this naturalistic bent, again in opposition to Vives, Fernel claims that all are brought about by physical causes. For example, blood boiling up in the heart brings about anger, hostility and vengeance. If left untreated, these physical causes of passions, bring about even further problems, such as causing serious disease when they become entrenched in our veins and marrows.¹⁷⁶

VI. Descartes and the *Passions*: Taxonomy, Function, and Treatment

¹⁷⁴ Fernel (1646, p. 68).

¹⁷⁵ Fernel (1668 p. 335).

¹⁷⁶ Fernel (1668p. 485).

While I am going to emphasize some of the similarities between Vives, Fernel and Descartes, I should first point out some of the most striking differences. Descartes' trademark insistence on clarity and order, results in significantly more methodical definitions and classifications of the passions. Descartes is also careful to separate the passions from other kinds of perceptions, where Vives and Fernel take it as a given. From this early emphasis on classification and ordering of the passions, Descartes is able to delineate his precise interest in passions of the *soul* as opposed to perceptions or, in other words, bodily passions.¹⁷⁷ Regarding the division between passions and general perceptions, Descartes' discussion relies on common sense, or common opinion, to differentiate between mere perceptions from passions of the soul. In §25 of the *Passions*, Descartes restricts the term 'passions' to refer only to those things that *we generally take* as being located in the soul itself.¹⁷⁸ Other perceptions, carried by the nerves, which we generally take to be located somewhere within our corporeal bodies, are not to be considered passions proper. For example, a pinprick on one's finger would be considered merely a perception, as we would *generally* say that the pain feels as if it were in our finger. However, the anxiety that preceded the pinprick, seemingly impossible to localize, would generally be considered as having its seat within our soul. To be sure, this distinction is a bit fuzzy and it is odd that Descartes would make such a loose distinction based on our initial intuitions or reactions. This is especially paradoxical given the many obvious potential problems in using common opinions, or first impressions, in establishing one's taxonomy (i.e. phantom limb pain, "prejudiced"

¹⁷⁷ By "bodily passion" I mean only to section off feelings of hunger, thirst, and pain, as Descartes does. These differ from most other perceptions as, according to Descartes, we generally tend to locate them within the body and dealing with the body's functions.

¹⁷⁸ Les perception qu'on raporte seulement à l'ame, sont celle don't on sent les effets comme en l'ame mesme (AT XI, 347).

people believing that color is in the object not the perceiver, love is in the heart, etc.). Further, even though we generally have the first impression that our passions cannot be localized, after study, we might find that many of our passions have strictly bodily causes. Indeed, for Descartes, many passions have their origins in the heart. While the close connection between the body and the soul results in an odd doubling of passions (i.e. a bodily representation of a passion and a mental representation of a passion), these anatomical observations are superseded by the phenomenological as the guiding criterion for Descartes' taxonomy.

Distinguishing the passions from perceptions through our common opinion of their perceived location is, however, quite important for Descartes' general strategy of the *Passions*. A passion of the soul consists of two parts: first, the bodily movements (including animal spirits and motions of the organs), and second, the thoughts that are attached to these bodily movements. As we will see later on, these two halves of the passions are not necessarily connected in any way, instead they are contingently conjoined depending on the individual's own physiology. In keeping the distinction between the two as fairly amorphous and dependent on perception, Descartes is able to keep the connection between the soul and body equally mysterious, all while still considering it to be an object of scientific study. While there is certainly a tight connection between the mind and body, how they interact or how a thought becomes conjoined with a bodily state needs to remain somewhat arbitrary. If the distinction between the two were to gain some objective standard, say in a bodily process, then the body would determine the soul absolutely. This in turn would put us in the same category as soulless animal-machines. The phenomenological aspect of the passions is therefore necessary to defining passions as the physical aspect it is correlated to needs to

have the ability to vary. As I will be arguing later, this division is also part of the solution to how we can connect Descartes' ethical writings to his physics.

With this methodological taxonomy in place, Descartes is able to move to discussing the role passions play. He claims that the function of the passions is “that they dispose our soul to want the things which nature deems useful for us, and to persist in this volition.”¹⁷⁹ These things that nature deems useful for us seem to be entirely bodily and have health as their end. Fear, for example, prepares the body to flee danger; while cheerfulness informs us we are in good health.¹⁸⁰ Thus the passions fill a vital role for Descartes, informing the mind with regards to how to preserve the body—something it would be clueless of on its own.¹⁸¹ As we saw, Fernel assigns little to no positive function to the passions; although, the passions can serve as outward signs of an oncoming sickness. This might seem to be quite positive if the passions themselves were not considered to equally be the cause of the sickness they signal. Vives' position, however, is strikingly similar to Descartes'. Vives claims, “[Passions] are spurs to move the soul this or that way, [and] reins to restrain it from running into the harmful.”¹⁸² While standard stoic treatises claim that passions should be eliminated, Vives presents an immediate precursor to Descartes' on claim that passions have desirable content. Yet, while all passions for Vives are about some good or some evil, some passions lead toward vice or virtue depending on their object. In contrast, Descartes insists that he finds almost all passions to be wholly good. According to Descartes, the extent that the

¹⁷⁹ CSM, 349; AT IX, 372.

¹⁸⁰ CSM, 343; AT IX, 359 and CSM 361; AT IX, 399.

¹⁸¹ Many of the so-called “rationalists” of the modern period fully accepted that questions of health, diet, and medication need to be discovered empirically; see Smith (2016, 332-338).

¹⁸² Vives (1989, p. 4).

passions do err is a question of degree to which they impel the will, not a function of their objects.

Regarding treatment of the passions, there is a sizeable degree of similarity between all three thinkers not found in the traditional stoic and scholastic context associated with Descartes. Descartes gives several means of alleviating the negative effects of the passions. At the end of part two of the *Passions*, Descartes claims that pursuing virtue is the chief remedy against the passions. However, it is important to note that Descartes' definition of virtue is less than traditional. In §144, he notes "the pursuit of virtue consists in doing the good things that depend on us." He later defines it in §148 as "[living] in such a way that his conscience cannot reproach him for ever failing to do something he judges to be the best." This is a close echo of one of Vives' remarks, citing firm judgment as a means to avoid unnecessary agitation. However, Vives also suggests distraction, even by strong drinks or blood-letting to reduce the strength of overwhelming passions. In this regard, Vives' scattered comments for regulating the passions are fairly noteworthy in that they advocate both mental and physical remedies. Fernel, as we have already seen, advocated strictly physical remedies. For Descartes, exactly how to classify his remedies is a bit murkier of a question, although I will argue that like Vives and Fernel, we should see the physical playing a central role.

When we examine Descartes' chief remedy against the excesses of the passions, pursuing virtue, it appears as though much of Descartes' therapy against the passions resides within the mind alone—specifically the will. However, at least part of the solution to mastering the passions must necessarily be bodily at its core. In §141

Descartes fundamentally limits his interest in the nature of the relationship between the passions of the soul and the body.

If we had no body, I venture to say we could not go too far in abandoning ourselves to love and joy, or in avoiding hatred and sadness. But the bodily movements accompanying these passions may all be injurious to health when they are very violent; on the other hand, they may be beneficial to it when they are only moderate.

This makes it clear that when we are correctly moderating our passions, our bodies are physically healthy. A sure sign that the passions are disordered is sickness or disease in the body. Further, we can begin to see that if we want to consider Descartes' treatment of the passions as a moral treatise, we must recognize that knowledge of the body and its health is central to the project.

Later in the *Passions*, Descartes makes a new claim that the general cure to excessive passion is generosity. Here again we must be careful to note how Descartes defines his terms. In §153 Descartes elaborates on exactly what he takes generosity to be: "First...knowing that nothing truly belongs to him but his freedom to dispose his volitions...[and] second...his feeling within himself a firm and constant resolution to use [his will] well." So, generosity looks very similar to what was previously defined simply as "pursuing virtue."¹⁸³ However, to fully connect Descartes' claim that "pursuing virtue" is the cure to excessive passions back to the body, we need only look to his account of how thoughts become attached to particular movements of the animal spirits and how the will interacts with the body. Descartes' answers to these problems are not tailored to

¹⁸³ Rodis-Lewis (1987) does an excellent job connecting this claim to previous ones made by Descartes. She is also quite thorough in documenting its connections with Descartes various claim on free will—a topic too broad to address here.

any specific human, but instead he presents an abstract method that can be applied to each person. He does this because each person would need to take into account their own particular physiological and mental properties. Thus, in connecting the body to the mind Descartes must at the same time account for how it is possible that the same bodily state can produce different effects in different people. His answer to this is twofold. First, some people's brains are simply constructed differently, which gives the animal spirits different paths to follow, resulting in different responses to certain stimuli.¹⁸⁴ The second part of his answer leaves a bit more room for interpretation. Descartes reasons that when we are first introduced to a certain movement of the animal spirits there is some variation on which thought becomes associated with it. It is unclear if these variations allow for some action of the will, or if it is simply repeating the earlier claim pointing to different physical developments resulting in different effects. However, in both cases, once a thought is joined to a certain movement of the animal spirits, it is permanently joined to it. The result is that we simply cannot will our passions away, or reassign them to different thoughts. Instead, Descartes' solution is discovering workarounds aimed at counteracting the particular flow of animal spirits. Accomplishing this is described through the analogy of attempting to enlarge one's pupils. It is not sufficient to merely will one's pupils larger, which would be futile by itself. Instead the effect of enlarging one's pupil can easily be achieved by directing one's gaze far into the distance.¹⁸⁵ Thus directing the will in indirect ways can serve to alter the course of the animal spirits toward achieving the outcome of the second order intention.

¹⁸⁴ CSM, 343; AT IX, 358.

¹⁸⁵ CSM I, 344; AT IX, 361-362.

The most important element of this workaround strategy is Descartes' claim that thoughts can affect the passions, but only insofar as they affect the body. If the particular movement of animal spirits that cause a particular passion is present, then the thought will naturally be present as well. Changing our thoughts can only affect the motion of the pineal gland, which in turn can affect the animal spirits; however, we must determine which movement of the gland correctly counteracts the movement of the spirits, which can only be discovered empirically. In short, while having firm and resolute judgment is effective, it is only successful insofar as it has the correct physical effect, which is a contingent fact. In other words, if we are unable to correctly adjust the flow of animal spirits, the passion will persist—willing a passion away is not sufficient. Further, given the subjectivity of how passions are connected to thought, there is no guarantee that Descartes' solution will work for everyone. In short, the bodily aspects of the passions, like in Vives and Fernel, cannot be ignored. As I will argue, it is these bodily aspects of curing passions and the passions negative effects that, like his predecessors, are necessary for Descartes' ethics to gain any traction.

VII. Returning to the Problem

The common theme we can see running through Descartes' treatment of ethics is being steadfast in one's decision. This appears as being "firm" in one's actions in the two versions of the provisional code, and later as "generosity," or "pursuing virtue" in the *Passions*. But the problem still remains: if this is the entirety of Descartes' ethics, then it pertains only to the strength of the will, which appears to entirely remove any possible importance for any study of physics, let alone medicine and mechanics, as described in the tree analogy. However, the *Passions* adds considerably to the provisional morality in that firmness in judgment and action is not merely valued for its role in coming to truth;

instead, it is invoked in relation to the causal relationship not only between the body and mind, but also between the mind and body. Just as revealing is the workaround strategy Descartes endorses for counteracting the passions. If Descartes ethical theory is purely mental, why bother mastering the bodily aspects of the passions at all—especially if it requires us to expend a fair amount of mental energy and consideration? The answer is relatively straightforward: the mind body union is so tight that the needs of the body simply cannot be ignored. Descartes points out exactly how tight this connection is in the *Meditations*.

For my experience was that these ideas came to me quite without my consent, so that I could not have sensory awareness of any object, even if I wanted to, unless it was present to my sense organs; and I could not avoid having sensory awareness of it when it was present.¹⁸⁶

This is a position Descartes retains throughout the *Passions*. In short, the body cannot fail to impose itself on the mind, which brings about part of the need for a treatise on the passions in the first place—physiology included.

Much of Descartes' solution presented in the *Passions* is a means to train oneself to impose the mind over the body more effectively. Through the workaround method and pursuing virtue one should be able to begin to redirect various blood flows to reduce the overpowering effect of certain passions. But if we accept this, it is still unclear how the *Passions* is to connect back to the ethics of the *Discourse* and correspondence, as the end goal is just affecting a bodily state and health. As I have pointed out earlier on, it is always important to pay very close attention to Descartes is using his terminology in the *Passions*, since he often takes what we would normally consider to be ethically laden

¹⁸⁶ CSM II, 52; AT VII, 75.

language (i.e. “virtue”) and subverts it (i.e. using it merely to denote having a firm resolution or to use one’s faculty of reasoning well). Along these lines, it is very tempting to classify the *Passions* simply as a medical text, keeping in mind the great lengths Descartes goes to in detailing the physiological aspects of the passions, not to mention the great advantages an adept control of the passions would provide for maintaining the health of the body machine.

To return the *Passions* and its remedies back to the ethical discussion we need to make yet one more diversion through the *Meditations* and Descartes’ understanding of a free will.

In order to be free, there is no need for me to be inclined both ways; on the contrary, the more I incline to one direction—either because I clearly understand that reason of truth and goodness point that way, or because of a divinely produced disposition of my inmost thoughts—the freer is my choice.¹⁸⁷

In other words, Descartes affirms here in Meditation IV that the will that is the freest is the one that conforms the most to reason. Now, it seems apparent that this type of freedom is of central importance to both the provisional moral code and later his concept of generosity, given their dependence on firm judgment and following reason. Thus we can start to tie these disparate themes in the *Passions* and other moral writings. The final missing piece to the puzzle comes in a letter to Elisabeth from May of 1646.

¹⁸⁷ CSM II, 40; AT VII, 57.

I agree that remedies against excessive passions are difficult to practice, and also that they are insufficient to prevent bodily disorders; but they may suffice to prevent the soul being troubled by them and losing its free judgment.¹⁸⁸

This type of argument, that your mood and bodily state have a direct impact on your reasoning ability and further your capacity to follow whatever that ability dictates, was common at the time and found readily in both Montaigne and Charron.¹⁸⁹ Thus, control of the passions is indeed relevant to our ability to reason and, consequently, to our very freedom.

In short, to be an ethical being we must learn a great deal about our own bodies to ensure we can correctly follow that path prescribed to us by reason. Given that the physical aspects of passions can and do effect our mental states, even to the point of overwhelming us, we must learn how to control them. To do this, we must perform dissections, study the nervous system, blood flow, and the heart—just what Descartes did and partly conveyed in the *Passions*. To further understand how these various biological systems function, we must first understand the basic principles of mechanics. The motion of the muscles, organs, and veins, are nothing more than the simple machines outlined in Descartes' various treatise on mechanics. The knowledge of Cartesian physics is also essential for the task. For example, to understand the Cartesian description of the nervous system, we must recognize the various properties of subtle matter (or in this case, "animal spirits"), such as its ability to move at incredible speeds, all detailed in the *Principles*. We must further understand that this tiny matter running

¹⁸⁸ CSMK, 287; AT IV, 411.

¹⁸⁹ See for example arguments in Montaigne's *Apology for Raymond Sebond*, pg. 122, or Charron's *De la Sagesse*, pg. 104. These are fairly standard skeptical arguments that, given the incredibly tight connection between body and soul that Descartes requires, need to be dealt with eventually.

through our nerves and filtered through the blood is infinitely divisible, which allows for its motion in a closed system. All this in turn needs to be understood in terms of the plenum, and removed from phony explanations, such as fear of a vacuum. To put it bluntly, the body is nothing but mechanics and Descartes' physics is mechanical. This mechanical knowledge should, under my interpretation, help you understand how to redirect the physical bits of matter coursing through your system to keep your mind maximally free. Thus, there must be an empirical side to ethical study, and this empirical side will necessarily relate back to Descartes' physics. All of physics, mechanics, and medicine are central to understanding the way the body works and the power that the body can hold over the soul.

VIII. Conclusion

It is clear that Descartes is situated in a wildly diverse context when undertaking a treatise on the passions, which includes the medical, ethical, as well as therapeutic. On the medical side, Fernel being the exemplar here, Descartes seems quite at home when discussing the causes of the passions. Yet when considering the possible cures of the passions, his main solution is not any type of medication but mental fortitude, which in turn has physical consequences. Equally, the passions contain information that is useful to the maintenance of the mind body union. While this does bring Descartes that much more in line with the medical tradition, it is equally important to point out that arguing for the utility of the passions, draws a non-negligible distinction between traditional conceptions of stoic ethics. Returning to Vives, we can find great affinities with Descartes' own account—most notably that the passions are instilled in us to seek out good and avoid evil. Yet, Descartes remedy again sets him apart, insofar as it allows for

the malleability of the passions to our will and the possibility of reassigning mental representations of passions to different physical manifestations of them.

The initial divide we noted early on, between the purely mental characteristics of the morality discussion in the *Discourse* and correspondence, is solved through the blending of these traditions while maintaining his desire to have both empirical and metaphysical pursuits of knowledge. Thus, the more explicitly moral musings through the correspondence should be seen merely as the first half of what a more perfect moral system would look like. We might even consider the provisional moral code as what an ethic might look like if we were not conjoined with a body. But because we are joined with a body, there needs to be some treatise like the *Passions* to give us a guide for controlling the body using our will. This is not to say that the *Passions* are anything close to a perfect moral system, but instead yet another building block toward it. The *Passions* thus serves as the intermediary branch that just begins to connect the uppermost branch of Descartes' tree of philosophy, the perfect moral system, to the trunk and roots. Given this interpretation we can both understand how he is able to claim to be writing the *Passions* qua physicist, while at the same time defending its place in his moral corpus.

CHAPTER FOUR:

THE EXPERIMENTAL PHYSICS OF JACQUES ROHAULT

I. Introduction to Rohault

Jacques Rohault (1618-1672) was, if nothing else, a diligent champion of Cartesian thought. In 1664, Rohault took as his second wife, Geneviève Clerselier,¹⁹⁰ daughter of Claude Clerselier, editor and zealous propagandist of Descartes works,¹⁹¹ and thus sealed both his patronage and link to Cartesianism. As has been well documented, Rohault was an avid experimenter,¹⁹² holding weekly Wednesday conferences from 1659 until his death in 1672, where experimental results were demonstrated and discussed.¹⁹³ The emphasis on experiments practiced by Rohault was thoroughgoing; flipping to almost any page of his multi-volume *Traité de physique*, first published in 1671, one will almost certainly find some experiment or another described in great detail. This, of course, seemed to be quite on par with the burgeoning *salon* culture of the second half of the 17th century in France, and the development of experimental societies in England as well.¹⁹⁴ However, this emphasis on

¹⁹⁰ The most extensive biographical work on Rohault remains Clair's excellent *Bio-Bibliography* (1978).

¹⁹¹ See McClaughlin (1979) for a description of the great lengths that Clerselier went to disseminate Cartesian philosophy.

¹⁹² See McClaughlin (1979, 1996, 2003), Dobre (2013), Roux (2013b), Clair (1978), Thorndike (1934, p. 679), and Mouy (1934).

¹⁹³ McClaughlin (2003) p. 331.

¹⁹⁴ Roux (2013b) and McClaughlin (1996) are particularly helpful on this point.

experimentalism, I will claim, came with a certain lack of attention to other areas of the Cartesian corpus, as an obvious lack of metaphysical musings is hard to miss in the *Traité*. This is not to say that experimentation and Cartesianism are in any way opposed to each other—on the contrary, as we have seen in previous chapters, there are a great number of instances where Descartes himself urges the need for experimentation when investigating nature.¹⁹⁵ Along these lines, many commentators on Rohault take him to be a rank and file member of the Cartesian sect despite the omission of metaphysical details.¹⁹⁶ To be sure, there are a number of avenues available to explain Rohault’s lack of metaphysical interest without being forced to concede that he is attempting anything novel. In what follows, I will first set the stage for my thesis by presenting some of the standard interpretations of Rohault’s *Traité*, and discussing what ways have been used to explain the absence of a metaphysical analogue to Descartes’ *Meditations*. Next, I will present a case study in Rohault’s experimental philosophy with the example of his extensive experimentation on the void. This will be contrasted with Descartes’ own discussions of the void and some of his thoughts on the relation of metaphysics to experimentation, using some of the discussion from the previous chapters. With this all in place, I will demonstrate how Rohault’s methods, not his conclusions, mark him out as carving out a unique niche for himself that has been unappreciated by scholars up to this point. In short, I will show that while Descartes’ own take on experiments depends crucially on having a well sorted metaphysics, Rohault’s system is designed to remove

¹⁹⁵ Most notable are the remarks he makes in the *Discourse on Method* (AT VI, 22, 29, 63-65, 94).

¹⁹⁶ Des Chene (2002) p. 184, for example, portrays Rohault as the opposite of an innovator, looking only to fill out Descartes system. McClaughlin, as well, claims him as a “meticulous Cartesian,” following Descartes to the last detail (1979) p. 570.

the need for metaphysics all together, which has broad consequences visible in his method.

II. Possible Explanations of Rohault's Missing Metaphysics

It was commonplace in treatises on Cartesian natural philosophy, among the most well-known 17th century Cartesians, to briefly survey Cartesian epistemology and metaphysics, running first through doubt, and then to the first bits of knowledge—God, the self, etc. For example, in Antoine le Grand's *An Entire Body of Philosophy*, chapter II very briefly runs through the proof of God's existence, via our innate idea of him, and the *cogito*. Along with this, clear and distinct ideas are established the hallmark of truth and knowledge. Similarly, in Pierre-Sylvain Régis'¹⁹⁷ *Cours entier de philosophie*, the first book runs through a brief history of philosophy, culminating with, of course, Descartes. Régis passes briefly through Descartes' *Discourse on Method*, and his *Meditations*, before continuing on to the bulk of his treatise, explaining the nature of man qua body, qua mind, and qua mind-body union.¹⁹⁸ Needless to say, the repetition of Descartes' basic metaphysics and epistemology seemed almost a formulaic necessity among the early Cartesians, especially in the textbook tradition.¹⁹⁹ Rohault, whose *Traité* was published before Le Grand and Régis' books, defined a different path. To

¹⁹⁷ Régis was one of Rohault's most famous students.

¹⁹⁸ Régis was very engaged in defending Cartesian metaphysics. In 1691 he published a detailed response to the slew of objections from Pierre-Daniel Huet's *Censura*. See Thomas Lennon's introduction to his translation of Huet's *Censura* for a more detailed account of Huet's anti-Cartesianism. See also chapters 1 and 2 in Lennon (2008).

¹⁹⁹ This is not to say, however, that their repetitions of Descartes' metaphysics were completely orthodox. A great many differences and disagreements can be found in the majority of the early Cartesians. However, the fact that there is an inclusion of metaphysics at all, following good Cartesian order, is sufficient for my thesis forwarded here. It is also important to note that these books have different purposes. For example, Régis' *Cours entier* was meant to be a complete textbook for Cartesian philosophy, while Rohault's *Traité* was only meant to cover physics.

begin, Rohault, unlike the philosophers mentioned above, never attempted a complete curriculum in Cartesian philosophy, and beyond any form of robust physics, there is no mention of ethics either. Indeed, there is little doubt that Rohault's treatise was designed to be solely a treatise on physics, with no promise of future expansion into a complete curriculum. Even so, given the tight relationship between physics, metaphysics, and experimentation that Descartes' own system of natural philosophy entails, it is unusual for any follower of Descartes to attempt a discussion of physics without the necessary toolbox provided by Cartesian metaphysics.²⁰⁰

Trevor McClaughlin has conjectured that this notable absence of metaphysics might be explicable through a closer examination of the historical context surrounding Cartesianism in the 17th century. McClaughlin points out that less than ten years after Descartes' death a long series of censures, condemnations, and warnings were issued to those practicing Cartesianism, which resulted in a very explicit fear among the early adopters.²⁰¹ McClaughlin's claim is that Rohault, reacting directly to fear of these condemnations, shied away from making bold metaphysical claims that could easily be misinterpreted and lead to trouble, instead retreating back toward the relatively uncontroversial realm of experimental natural philosophy.²⁰² While McClaughlin never goes so far as to say that this was Rohault's only motivation, we should certainly play close attention to the significant evidence that it was a consideration weighing heavily on his mind and influencing his publishing decisions. Indeed, Rohault even took some

²⁰⁰ Of course there is the notable exception of Regius, whose *Fundamenta Physices* was equally scant on metaphysics. See Verbeek (1994).

²⁰¹ McClaughlin (1979), 578. The main thrust of these condemnations seems to have been centered on Descartes account of the Eucharist, among some of his other metaphysical claims.

²⁰² See McClaughlin (1979) and, to a lesser extent, (2003).

precautions in having his peers to adopt different strategies to avoid any unwanted attention. In a letter to Nicolas Poisson from the 4th of July 1671, Rohault expresses some concern over the bold position Poisson has taken regarding animal souls in his *Commentaire ou remarques sur la method de René Descartes*.

One must be attentive to the enmity and malignancy of those people who must not be irritated. If you could believe me, I would counsel you to take care in the choice of things you treat, and if I were in your place, I would abstain from touching those topics that are the furthest from people's preoccupations. I would imagine that it suffices to teach the first elements of the philosophy of Mr. Descartes, as I have attempted to do, and for the rest, those who will be the slightest initiated, will fall in of themselves.²⁰³

This brief comment goes a long way to showcase Rohault's prudence. While it is impossible to deny the influence of political considerations in Rohault's work, in what follows, I wish to highlight that Rohault's exclusion of metaphysics cuts much deeper into his philosophy than simple prudence would suggest. Specifically, it will become clear that Rohault's method, and his manner of exposition goes starkly against the Cartesian project and shows that not only did Rohault not want to include Descartes' metaphysics but had disagreements that were in stark opposition to it.

III. A Brief Note on Rohault's Rhetoric

At a superficial level, Rohault's rhetorical strategy, like that of many of his Cartesian contemporaries, was designed to distance himself from the novelty and controversial nature of Descartes' natural philosophy. For example, Rohault repeats the well-worn declaration that his own work in no way disagrees with the Aristotelean

²⁰³ Clair (1978) p. 168.

philosophy and contains nothing truly novel in it. Of course, paying lip service to the philosophers was in no way shocking, even Descartes consistently wrote that his own philosophy presented nothing new and Aristotle would agree with it. However, Rohault goes one step further than Descartes in his *Entretiens sur la philosophie* and highlights exactly what he takes to be the benefits of his work, or how it compliments Aristotle.

If one wants to show that [Aristotle] was wrong, it will only be in certain places, where even the Aristotelians abandon him, and more so in some other places regarding things that have only recently been discovered through the invention of the telescope, microscope, and through certain recent experiments that this ancient philosopher was not aware of.²⁰⁴

Thus, much of the advantage to be gained from a new philosophy is brought about through expanding knowledge through a more modern experimental method and recent developments in scientific instruments.²⁰⁵ Yet, as one would expect in a Cartesian text, the praise of Aristotle's work is usually followed by some veiled slight; at one point, Rohault claims that Aristotle represents just the first step, where the more specific and "loftier" knowledge will come from his successors—assigning knowledge gained from experimental methods a "loftier" status is something Descartes never came close to endorsing. This belittling of speculative philosophy (i.e. one that produces no practical results) is abundant throughout Rohault's works, while the art and practice of the craftsman is lauded.²⁰⁶ This emphasis on practical results above all else is a consistent theme throughout Rohault's works, and the main cause to search for a new philosophy.

²⁰⁴ Rohault (1671) p. 105-106.

²⁰⁵ Comments like these also appear in Rohault's *System (Preface, non-paginated)*.

²⁰⁶ This sentiment is also expressed by M.N., Rohault's interlocutor in his *Entretiens* (Rohault (1671) p. 109-110).

Descartes, in contrast, famously noted the constant flux and diversity of opinions in philosophy so as to showcase the stability and consistency of his paradigm of knowledge, mathematics. Rhetorically, it is quite telling that Rohault adopts the results of artisans to show that the ancient philosophy is deficient; and even though Descartes' preferred example, mathematics, is acknowledged by Rohault as constantly improving over the years based on reason, the artisans, as he also notes, improved, but without requiring the same theoretical foundations.²⁰⁷

IV. Descartes and the Void

Moving past Rohault's rhetorical style, into the depth of Rohault's divergence from Descartes, I would like to first to look at Descartes' treatment of the possibility of a vacuum or void, and then reflect upon Rohault's own discussion of the matter. We can see the first discussion of the void, although it is quite brief, in the *Regulae*, where Descartes roundly rejects the possibility, and gives an early version of an argumentative strategy that will be consistently used throughout his works.²⁰⁸

If, say, we conclude that a given space full of air is empty, on the grounds that we do not perceive anything in it, either by sight, touch, or any other sense, then we are incorrectly conjoining the nature of a vacuum with the nature of this space.

This is just what happens when we judge that we can deduce something general and necessary from something particular and contingent.²⁰⁹

This basic argument is later developed to explain how we come to have a word 'empty' if the world is completely full, or a *plenum*.

²⁰⁷ See the preface to Rohault's *System*.

²⁰⁸ However, Descartes is not quite so direct in *The World*—I imagine this is due to the rhetorical strategy he adopted in that work.

²⁰⁹ AT X, 424; CSM I, 48.

In its ordinary use the term ‘empty’ usually refers not to a place or space in which there is absolutely nothing at all, but simply to a place in which there is none of the things that we think ought be there. Thus a pitcher made to hold water is called ‘empty’ when it is simply full of air.²¹⁰

In short, whenever we use the term ‘empty’ we merely mean full of something else, otherwise the word will have no meaning at all.

Of course, none of this is a very strong argument against the possibility of the void—at best this claims that any concept of the void is not based on actual sense experience, but this does not represent the sum total of Descartes’ arsenal against the void. Throughout his works, Descartes gives a total of three distinct arguments against the void’s possibility. The first is one claims that the simple concept of a void contains an internal contradiction: “nothing can have no properties.”²¹¹ This is expressed most strongly to Mersenne when Descartes asserts that it is just as impossible for there to be a void in nature as it is for a mountain to exist without a corresponding valley.²¹²

Descartes’ second argument is from the inconceivability of anything like a truly empty space. Simply put, it is impossible for us to conceive of a void; therefore, one must not exist.²¹³ The third and most sophisticated argument, which is very closely related to the previous two, is that our concept of substance and space are, in fact, identical; thus, by

²¹⁰ AT IXb, 72; CSM I, 230. This style of argument also occurs in the sixth meditation.

²¹¹ This basic line is repeated often. See a letter from 29 July 1648 for Arnauld (AT V, 223); CSMK 356; August 1649 to More (AT V, 403; CSMK, 381); and in the *Principles* (AT IXb, 72); CSM I, 230.

²¹² 15 November 1638 (AT II, 440; CSMK, 131).

²¹³ See again the letter for Arnauld (AT V, 224; CSMK, 359); also, 6 June 1647 to Chanut (AT V, 52; CSMK, 320).

definition, any space must be completely full of matter.²¹⁴ This collapse of substance and place happens quite abruptly in part II of the *Principles*.

When we say that a thing is in a given place, all we mean is that it occupies such and such a position relative to other things; but when we go on to say that it fills up a given space or place, we mean in addition that it has precisely the size and shape of the space in question.²¹⁵

Slightly further on Descartes goes on to clarify this point.

For a body's being extended in length, breadth, and depth in itself warrants the conclusion that it is a substance, since it is a complete contradiction that a particular extension should belong to nothing.²¹⁶

It is important to note here that all three arguments are *a priori*, which is to say, despite Descartes' frequent use of analogy, experience, and experiment to justify his claims in the *Principles*, his objection to the existence of the void rests solely in the intellect. This is evidently why, when pressed on this issue by More, Descartes is forced to admit that if God were to annihilate all the matter contained in a vessel, the sides must necessarily come together.²¹⁷ Even in the face of divine omnipotence, Descartes simply will not budge on this issue.²¹⁸

Interestingly, Descartes is not always quite so abrupt when addressing questions of the void. As one of my central claims will be that Rohault and Descartes begin to

²¹⁴ Woolhouse (1994) calls this a "thick" conception of space.

²¹⁵ AT IXb, 70; CSM I, 229.

²¹⁶ AT IXb, 72; CSM I, 230.

²¹⁷ AT V, 272; CSMK, 363.

²¹⁸ This is especially interesting given Descartes' position on the eternal truths. In short, in an exchange with Mesland, Descartes explains that God's absolute power is unbounded, and he could even do things that seem contradictory, such as creating creatures that are not dependent on him for their existence (AT IV, 119; CSMK, 235).

come apart on questions like the coherence of the void—where Descartes considers it to be nothing more than common language misfiring in philosophical discourse—it is worthwhile to quickly address the cases where Descartes seems quite willing to adopt the terminology of the void to make a point. In an early letter dated sometime between October and November 1631 Descartes writes to Mersenne, "I am not going back on what I said concerning the speed of weights falling in a vacuum. For if we suppose a vacuum, as everyone imagines that there is, the rest follows demonstratively."²¹⁹

Similarly, in a letter dated 13 November 1639 Descartes writes again to Mersenne, "You were quite correct to hold that in the void itself, if it be possible, a stone will go slower or faster, insofar as it was moved slowly or quickly."²²⁰ To come to terms with how Descartes might have been using the term "void" here, it might be useful to jump slightly forward to the *Principles*, where he asks us to consider several scenarios involving "empty space."²²¹ By "empty space" Descartes means a space that is "full of a matter that does not contribute anything to the movement of other bodies, and does not impede it either."²²² Descartes goes on to explain how this type of empty space would affect matter moving away from a rotating body. He claims that if we were to suppose this type of empty space along the path of matter moving away from the rotating body, in this case the sun, matter closer to the rotating body would move to "fill up that space."²²³

²¹⁹ AT I, 228; CSMK, 33.

²²⁰ AT II, 618.

²²¹ Of course, I am not trying to claim that the use of "empty" space found in the *Principles* is the same use of "void" in his early correspondence; instead I merely want to claim that the *Principles* highlight an epistemological avenue that was never ruled out, and at time explicitly endorsed, in Descartes' philosophy.

²²² AT IXb, 133.

²²³ "[S]i le lieu marqué F estoit vuide, toute celle qui sont en l'espace BFD, s'avanceroient autant qu'il se pourroit afin de le remplir, et non point les autres" (AT IXb, 134-135).

However, the matter on the side of the empty space furthest from the rotating body would not advance to fill this empty space at all, due to the fact that it has no matter pushing it in that direction. Presumably, if the rotating body stopped rotating, thus causing the surrounding matter to also cease its motion, the empty space would not be filled. In effect, Descartes is claiming that even if there were to be something quite similar to a void, matter would be indifferent to it; in short, and in not terribly catchy terms, nature does not abhor a space filled with matter that contributes nothing to motion.

In yet another case of “empty space,” Descartes attempts to clear up his notion of gravitation through considering what would happen if the Earth were surrounded by “empty space,” in his technical sense of the word. The thought is that without the surrounding matter, that is to say, matter that provides resistance, we would not be held down and would therefore fly away from the rotating Earth; just as a ball “strives” away from a rotating sling and flies away in a straight line once the leather strap no longer holds the shot in place. Again, nothing here is very mysterious; Descartes is doing nothing more than creating what we might call today an idealized scenario.²²⁴

In both the early correspondence and in the *Principles* one thing seems abundantly clear—when Descartes uses the term ‘void’ or ‘empty space’, this is nothing more than coded language for an idealized scenario where certain variables are simply ignored.²²⁵ This can be done by either omitting the properties of matter, or simply giving it properties sufficient to counteract its normal effects. The latter strategy is adopted in his correspondence with Mersenne when he defines a non-resistant medium as where

²²⁴ See Zepeda (2013) for a lengthier defense of this point.

²²⁵ See Palmer (1999).

“all the parts of the surrounding liquid body are disposed to move at the same speed as the original body in such a way as to leave room for it and take up its room.”²²⁶

Descartes, it seems, can consistently hold that the terms ‘void’ and ‘empty space’ are incoherent, while, at the same time making use of them—so long as the meaning is sufficiently well subverted. It is equally clear that there is no reference to experience or experiment, nor does there seem to be any place for such reference at all in establishing the possibility or impossibility of a void in nature.²²⁷

The position that any experimentation on the void is a simple category mistake comes out quite clearly in Descartes’ correspondence. In letter to Mersenne, he is insistent that experimentally testing for a vacuum will be fruitless.

I do not know, given that your researchers of the void want to do their experiment in a chamber where it is so well sealed that the outside air would have no contact there. This is what they will not easily accomplish. But, if they do accomplish it, I assure you that the mercury will not in any way fall from the hose; not because it is lighter, nor that the column of air resists it more, but because there is no place in the chamber where it can move to, because it will be totally full of air.²²⁸

²²⁶ AT II, 482-483; CSMK, 132. Joseph Zepeda rightly points to this passage being noticeably absent in Eric Palmer’s essay “Descartes on Nothing in Particular.” This section, as Zepeda argues, nicely undercuts Palmer’s reading of Descartes as allowing a coherent concept of a genuine vacuum (Zepeda (2013) p. 130).

²²⁷ There are many instances where Descartes does think experience is required. A few examples are magnets, air resistance, fetal development, and a great many more.

²²⁸ 31 January 1648 (AT V, 116).

This insistence on reinterpreting any possible experimental results to conform to his theory persists during Pascal's famed Puy-de-Dôme experiment.²²⁹ Certainly, many have taken this experiment to show that there was such a thing as a vacuum, but Descartes, unsurprisingly, interpreted it quite differently. When later told of the results of the experiment by Carcavi, Descartes claims that he assured Pascal it would succeed because it conformed to his principles.²³⁰ Given his firmness on this issue, even in the face of elaborate experimental data, I would like to highlight two points. First, Descartes could never have envisioned the Puy-de-Dôme experiment as designed to test for the possible existence of a vacuum;²³¹ this kind of hypothesis was already ruled out before the experiment had even begun. Secondly, Descartes' metaphysics, established in parts I and II of the *Principles*, are used here as an interpretive lens for experimental data, and is epistemologically prior to it.²³²

V. Rohault on Metaphysics and the Void

All this should be of no surprise; Descartes' insistence on correct order in approaching natural philosophy is in no need of further commentary. Rohault's treatment of this issue, however, allows for some further remarks. In the preface to his *System*, Rohault quickly distinguishes his method from that of Descartes. While

²²⁹ During Puy-de-Dôme experiment a tube filled with mercury, sealed at one end and submerged in a vat of mercury at the other, was carried up the mountain to determine what would happen to the level of mercury. As the apparatus was raised up the mountain the level of mercury fell, leaving an empty spot at the top of the tube where the mercury once was. Pascal would go on to interpret this experiment as showing that nature did not abhor a vacuum, as they could easily occur, and that the drop in fluid level was resulting from the column of air above the apparatus being reduced as they ascended the mountain.

²³⁰ 17 August 1649, AT V, 391.

²³¹ Descartes claimed to have been the one who suggest the experiment to Pascal. See Descartes to Mersenne, 13 December 1647 (AT V, 99), and to Carcavi, 11 June 1649 (AT V, 365)

²³² See Chapter II.

Descartes, in many instances, used reason to move from the visible world to the invisible one (i.e. the world of infinitely divisible matter, tiny pores, and various shaped particles), Rohault intentionally only addresses what is necessary for practical results and shows little interest in theorizing beyond what is readily of use.

For instance, what good do those long and nice disputes do *about the divisibility of matter*? For though it could not be accurately determined whether it be infinitely divisible or no; it would be sufficient to know that it can be divided into parts small enough to serve for all purposes that can be.²³³

It is important to note that the infinite divisibility of matter is not only something that Descartes believes is known clear and distinctly, but he claims it is absolutely necessary for the proper functioning of his principles in nature.²³⁴ The fact that Rohault abstains from establishing the infinite divisibility of matter is, at its very core, already a major break from Cartesian method and physics. In other words, we see yet again that Rohault's only concern is the results and not the truth of theory that those very results are a function of.

Rohault believes that these types of philosophical arguments that result in no practical applications were part of the reason why the ancient philosophers did not succeed. Beyond quibbling over unimportant problems, Rohault alleges, the ancients erred insofar as they did not take sufficient account of experimentation, a problem resulting from an over emphasis on metaphysics and abstraction.²³⁵ Certainly though, among his lambasting of pure speculative philosophy, Rohault does allow for reason to play some role in his system, although its exact function is less than clear. At one point

²³³ Rohault (1723) *Preface*, non-paginated.

²³⁴ AT VIII, 60; CSM 239.

²³⁵ Rohault (1723) *Preface*, non-paginated.

in the *System*, Rohault motions toward reason giving us freedom to draw conclusions, but his only clarification of this point is that philosophers who overly privilege experiment, “hinder the knowledge of a large train of truths, which may many times be deduced from one single experiment.”²³⁶ So, here at least, the role of reason again seems only secondary to experiments, insofar as we reason from after an experiment, not before, as Descartes had insisted upon.²³⁷

Further dismissing Descartes’ manner of philosophizing, Rohault rejects hyperbolic doubt, as it is a “very difficult task,” and also where “there are a great many truths, which ought by no means be rejected.”²³⁸ This, fairly directly, highlights Rohault’s distrust of the most basic tenet of Descartes’ epistemology—and while this might again be a sign of his prudence regarding the fear of censure his claims that doubt can hinder the quest for knowledge might stretch this interpretation too far.²³⁹ However, despite rejecting the method of doubt, Rohault does accept the solidity of the *cogito* and that God exists, but offers no argument for this, explicitly leaving it as a task appropriate only to the theologians.²⁴⁰ All this evasion of metaphysics, with the rhetoric surrounding it, would fit nicely in McClaughlin’s thesis that Rohault avoided metaphysics out of fear of censure. Indeed, hyperbolic doubt, and Descartes’ arguments for God’s existence where among his most incendiary claims, worthy of caution. Criticisms of these points were frequent, and possibly quite dangerous for the author.²⁴¹ However, Rohault’s dissent from Cartesian method, as I shall argue, is not simply one of omitted words, but

²³⁶ Rohault (1723) *Preface*, non-paginated.

²³⁷ Cf. Roux (2013b).

²³⁸ Rohault (1723) vol. 1, p. 2.

²³⁹ Rouhault (1723) vol. 1, p. 2.

²⁴⁰ Rohault (1723) vol. 1, p. 5.

²⁴¹ See Verbeek’s *Descartes and the Dutch*, for an incredibly insightful look at the various troubles Descartes’ philosophy brought down on him.

how he actually proceeds with his positive project of natural philosophy is difficult, if not impossible, to marry with his status as a scrupulous follower of Descartes as many commentators would contend.

As a case study in Rohault's method of philosophy, we can turn back to our previous discussion of Descartes and the void to see just how Rohault dealt with the same topic. To be sure, the void was one topic where Rohault showed a great deal of interest, and caused a great deal of his fame. At his death in 1672, Rohault still possessed several instruments for performing experiments regarding the void; of which, one was a copper syringe, and the other was a box of glass tubes all specifically designed for experimentation on the void.²⁴² Rohault was equally fascinated with Pascal's Puy-de-Dôme experiment, even recreating it, although he was forced to scale down the experiment by climbing a church tower instead of a mountain and then descending to the surface of the frozen Seine to be able to accomplish the feat in Paris.²⁴³ All this seems to be part and parcel of a more general vacuum-mania sweeping both England and France during the 17th and early 18th centuries.²⁴⁴ However, whereas Descartes is dismissive at best of experimentation settling the status of the void, Rohault has no problem moving the question into the experimental realm.

Despite having "nothing has no properties" listed as one of his axioms,²⁴⁵ Rohault designs several experiments to test for just this fact. For example, when the mercury of a

²⁴² See McClaughlin (1976) 14-17. There were a great many more instruments and experiments described in chapter 12 of the *System*.

²⁴³ Rohault, 72. Dobre (2013) p. 213-218 also has a nice *discussion* of Rohault's work on the void.

²⁴⁴ For more history on experimentation on the vacuum in Royal Society and the Académie Royale des Sciences, see Shapin and Schaffer's *Leviathan and the Air Pump*, as well as Edward Grant's aptly titled book, *Much ado about Nothing*.

²⁴⁵ Rohault (1723) vol. 1, p. 18.

tube sealed at one end and submerged in mercury at the other descends slightly, the visibly empty space at the top posed quite a problem for those who denied the possibility of a void. The predictable Cartesian response is simple: there is no such thing as void, as if there were the sides would be touching, therefore, there must be some matter in the tube that entered through some pores. Rohault goes further than this, and concludes from light passing through the empty portion of the tube, there must be some matter filling the uppermost space. He also holds a flame to the empty part, and observes the mercury dropping, due, as he believes, to the rarefaction of the finer parts of matter still contained in the tube itself.²⁴⁶ Rohault is all too ready to address his opponents on experimental terms regarding this very fundamental question to Cartesian physics, even creating a device designed to simulate a vacuum inside a vacuum, later dubbed the *chambre de Rohault*. These types of experiments were also a major part of his famous Wednesday lectures.²⁴⁷ In an unpublished set of notes on Rohault's Wednesday meetings, the author notes the evidence gathered from Torricelli's experiments on problems with pumps only being effective to a certain depth.²⁴⁸ In short, experimenters found that a hand driven water pump would only be effective up to around 32 feet in depth, and beyond that it was concluded that anything remaining in the pump was void. Instead of arguing the results of the experiment, as one might expect, Rohault in turn

²⁴⁶ Rohault (1723) p. 64-65. One of the great benefits of using the Clarke edition of Rohault's *System* is his perceptive and biting criticisms inserted as footnotes. In this case Clarke is quick to note that there is no need to conclude from light shining through necessitates some form of matter being in that space. There is, as Clarke points out, equally good reason to believe that light would not be able to pass through a completely full space. Regarding the rarefaction of the empty space, Clarke is willing to conclude that small amounts of air very well could have entered into that space and are the cause of the rarefaction, and therefore, the slight fall in the level of mercury.

²⁴⁷ Roux (2013b), McCloughlin (1996).

²⁴⁸ Not much is known about these notes, but they are listed as being collected by a M. F. avocat. Rohault (1660) p. 12v.

offers his own experiment involving one of his syringes. He follows this up by recounting Pascal's barrel experiment in Rouen, then another experiment involving small vials of mercury, and yet another experiment performed at the top of the Tour Saint-Jacques by Rohault himself. All of this, Rohault concludes, clearly demonstrates that all experimental evidence points toward the weight of air causing the phenomena and not any void or fear of one. Opening up a question such as this to the experimental method, which should be settled only through reason according to Descartes, must be seen as a sharp rebuke to the Cartesian doctrine of clear and distinct perceptions, and the metaphysics associated with it. If Rohault is willing to reconsider and test even clear and distinct perceptions, which for Descartes are the paradigm of certainty, he must certainly be considered something less than a "meticulous" follower of Descartes.

VI. Conclusion: A Worthless Metaphysics

It might be objected, however, that Rohault's experimental confirmation of the plenum is merely aimed at rebutting popular views being propagated during his day. After all, it is true that many of Rohault's vacuum experiments end with a conclusion regarding properties of the column of air and its weight, but I believe this would be forcing Rohault to fit into a Cartesian shaped cookie cutter where he simply does not fit and ignoring the unique path that Rohault had laid out before himself. To be sure, there are many experiments that are specifically designed for testing properties of the column of air—for example, the *chambre de Rohault* cannot be understood as testing anything else. However, there are also series of experiment that cannot be made sense of without assuming they are designed to directly test the possibility of the void. For example, in Rohault's chapter in his *System* titled, "Of such Motions as are commonly ascribed to the Fear of a Vacuum" he demonstrates that light shines through the empty area at the

top of an inverted mercury tube. Just after this he notes that applying heat from a fire to this empty space causes the mercury to descend, showing that whatever is at the top of the tube is able to be rarified.²⁴⁹ Both of these simple experiments cannot be seen as trying to discover anything about the column of the air, nor can they be interpreted as trying to deduce properties of subtle matter. The fact that subtle matter conducted heat, could be rarified, or transmitted light, was never in question for the Cartesians—even if it were, there would be no need of such an elaborate experiment. My claim, however, is not just that in this one instance, Rohault believes himself able to experiment on a basic principle of Cartesian physics, but it is emblematic of a broader trend in his method of natural philosophy.

If we look some of other examples from Rohault's *System*, where he treats topics under the scope of clear and distinct perception, he consistently shies away from Descartes' own arguments, to the point of completely ignoring them. Rohault is simply uninterested in the type of certainty that Descartes' metaphysics is designed to confer. When discussing the existence of external objects, Rohault admits the force of doubt and relegates himself to speaking of a mere *possible* existence. Rohault's position on refraction is equally telling, and offers a sharp rebuke to the faith Descartes had placed in the force of reason concerning his explanation of refraction. After rehearsing Descartes' argument from the *Dioptrics*, Rohault comes to an apparent contradiction, the argument entails, "that the ball [used in the thought experiment] ought to be in two different places at the same time." In response to this problem, Rohault is all but completely dismissive of the force of reason.

²⁴⁹ Rohault (1723) p. 64-65.

But let us not imagine that there is any fault in the form of this argument which seems to conclude in an impossibility; let us rather say, that it be conclusive, it is a certain sign, that the fault was in some of the suppositions that were made. And so indeed it was, for we suppose that the ball, when it had lost half of its motion by meeting the superficies of the water, would enter into it, though it fell never so oblique, which is not so. For we see by experience in a Sea-Fight that cannonballs which are shot too oblique upon the water are reflected by the superficies of the sea.²⁵⁰

Experience then, in this case of sea battles, is the ultimate arbiter and corrects our well-reasoned argument. The charge then is that Descartes never adjusted his results to cater to experience, and thus falls into the same pitfall Rohault initially accused the ancients of. Whether or not this charge is justly leveled against Descartes, there are instances when reason alone is sufficient, and for Descartes, refraction has all the signs of being one of these cases.²⁵¹

To be sure, there might be many motivating factors pushing Rohault away from the broader metaphysical physics of Descartes, but the few instances where Rohault broaches questions considered to be under the purview of reason alone, he is not at all afraid to question, test, and reconsider them. While this is the mark of a good scientist, it is sadly not always the mark of a good Cartesian and should be recognized as a major departure for Descartes' faith in the force and truth of clear and distinct perceptions. To paint a broader picture, it does seem that Rohault is in agreement with Descartes on a

²⁵⁰ Rohault (1723) vol. I, p. 96.

²⁵¹ "I laugh at Mr. Petit and his arguments, and, it seems to me, we don't have any more cause to listen to him, as he promises to refute my refractions through experience as if he wanted to show that the three angles of a triangle did not add up to two right angles by using a poorly made T-square" (to Mersenne, 9 February 1639, AT II, 497).

great many things necessary for his physics (i.e. the world being a plenum, the existence of subtle matter and tiny pores, etc.), but without the metaphysics guiding his interpretations of experimentation, as we have seen, we have an interesting instance of a Cartesian in subject matter, yet not in method. With this in mind, we can come to a more crisp image of the separation between Rohault and Descartes. To borrow some terminology from Peter Anstey and Alberto Vanzo, there is a difference between an experimenter and an experimental philosopher.²⁵² An experimenter, on the one hand, is someone that critiques, and engages in experimentation. An experimental philosopher, on the other hand, is one that uses experimentation as the primary means of acquiring knowledge. Anstey and Vanzo classify Descartes as merely an experimenter, but I think this categorization is a bit too hasty. As we saw earlier in chapter II, Descartes is indeed an experimenter in regards to a great many questions. He actively critiques various experiments, but in no way acknowledge their validity regarding questions such as the possibility of void. On the other hand, contrary to Anstey and Vanzo, there are other areas where experimental data appears to be absolutely foundational for Descartes' conclusions (i.e. his theory of the rainbow or determining the speed of light). On the other hand, it is much easier to classify Rohault as an experimental philosopher and difficult to find places where he would be considered a simple experimenter. For Rohault, there appears nothing that is off the table for facing empirical testing. If all this is correct, we should conclude that the differences between Rohault and Descartes are more substantial than has previously been recognized. Lastly, by rooting Rohault more firmly in the experimental philosopher category we can begin to understand more clearly his recalcitrance to admit several of the central "discoveries" of Descartes based

²⁵² Anstey and Vanzo (2016).

on clear and distinct perception. Seeing Rohault in this light gives us a better understand of the type of experimentation he was performing—one that was not universally filtered through metaphysics—and further gives us a clearly contrast to understand Descartes' own experimental method.

CHAPTER FIVE

CLAUDE GADROYS AND CARTESIAN ASTROLOGY

While Descartes sought to build up knowledge through a methodological skepticism, his life seems to have been pervaded by a more practical skepticism for the science and medicine of his day. Descartes was openly doubtful of healing springs, blood-letting, and a great many other phenomena reported to him through his web of correspondents. Keeping his systematic natural philosophy in mind, it is not uncommon to hear Descartes portrayed as a banisher of superstition, yet, as I will claim, this is only half the story. To get a better handle on how Descartes influenced superstition and the occult, I will be limiting my discussion to his influence on astrology. To be sure, Descartes's impact on the history of astrology paints a very curious picture. Glancing at it from one angle shows the portrait of a man very much opposed to astrology and astrologers. Yet, if we look at a slightly different angle we see quite a different image; one of a man who established a system of philosophy and physics that, however unwittingly, provided a decidedly well-lit avenue for grounding the beleaguered science of astrology. To fully flesh out this second perspective on Cartesian thought I will be taking up the curious case of Claude Gadroys: an early Cartesian astrologist. To this end, I will first elaborate on some of the basic elements of Descartes's physics along with some of his explicit claims regarding astrology. Later, I will detail Gadroys's own theory, the theoretical complications it faced in finding a home in Cartesian physics, and the solutions to these complications. Lastly, I will try to draw some broader conclusions

about the relationship between Descartes’s own views on the occult, astrology, and the like, and the reception of the new mechanical philosophy. Specifically, I will show, through the case of Gadroys, that the reception of Cartesian thought, while often depicted in the secondary literature as a precursor to modern scientific thought and method, varied widely, and offered as much an avenue for the occult and fringe science as for any other philosophy.²⁵³ Along these lines we will see how mechanism, as broadly understood in the modern period, in no way excluded the possibility of a science of astrology, as has been often assumed.

To continue, if I may, the imagery of a portrait of Descartes, it will be *a propos* to begin with just that, his portrait. We can turn now to the engraving done in 1644 by one of Descartes’s close acquaintances, Franz Van Schooten the Younger.²⁵⁴ Descartes²⁵⁵ himself was generally quite pleased with the portrait, although he did have several complaints. He first complained that the beard and clothing did not at all resemble his own, but, more importantly, he objected to the text in the oval border surrounding the portrait.

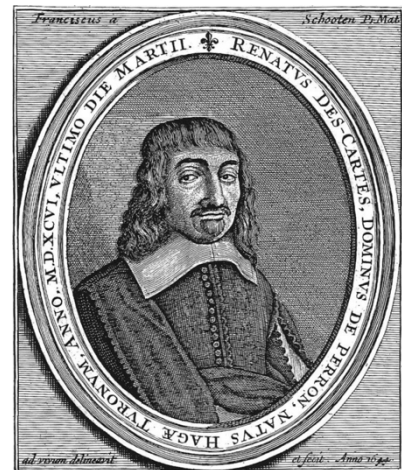


Figure 1: Descartes

Specifically, Descartes did not favor the title given to him in the border, and secondly, he wanted his birthdate removed. In Descartes’s own words:

I ask you to remove these words: *Perronij toparcha, natus die ultimo Martij*

1596. The first, because I have any aversion for any type of titles, and the last

²⁵³ It seems to be a general assumption among many scholars that the mechanism of the modern period led to astrology’s further fall into discredit, see Thagard (1978) for just one example of this.

²⁵⁴ For an excellent discussion of this and other images of Descartes see Nadler (2013).

because I also have an aversion for the makers of horoscopes, whose error we seem to be contributing to when someone's date of birth is published.²⁵⁶

Quite happily, because this is the only reason that we know his date of birth, Descartes did not get his way. His distrust for astrologers so neatly intimated here is not unique to this passage, as his repugnance for their science spills over into several of his correspondences, as well as the *Discourse on Method*, when he quite flatly asserts his own lack of credulity, "as for the false sciences, I thought that I already knew their worth well enough not to be liable to be deceived by the promises of an alchemist or the predictions of an astrologer."²⁵⁷

Despite Descartes's overt skepticism toward astrology, he did not likewise completely deny its efficacy. Quite to the contrary, Descartes believed that the prognostications of astrologers did work, albeit not for the reasons purported by the astrologers themselves. In a letter to Princess Elisabeth, dated 8 July 1644, Descartes highlights the mind's power over the body in cases of self-fulfilling prophecies brought on by negative predictions. "[There are] some people who are convinced by an astrologer or doctor that they must die at a certain time, and for this reason alone fall ill, and frequently even die."²⁵⁸ While this might seem a bit out of line with Descartes's mechanical worldview, the claim is not at all out of the ordinary for Descartes's general medical philosophy. Indeed, for Descartes, the mind has significant power to act on the body, which can cause the body harm or help it maintain or regain a healthy state—for

²⁵⁶ AT V, 338.

²⁵⁷ AT VI, 9; CSM I, 115.

²⁵⁸ AT V, 65-66; CSMK, 237. Far from just an abstraction, Descartes seemed to believe that this actually happened to an acquaintance, Hortensius, along with two young Italians (AT III, 15).

example, Descartes's advice to a sickly Elisabeth is to simply cheer up.²⁵⁹ These powers of the mind over the body and the body's influences upon the mind are brought out in great detail in both Descartes's *Passions of the Soul* and *L'Homme*.²⁶⁰ Thus, Descartes has a wide variety of mechanisms already in place to explain the real effects of astrology on their believers, yet has no need to reach as far as the stars to explain the influence.

From these passages, among others,²⁶¹ Descartes's position on astrology is abundantly clear: whatever efficacy the stars have on us, it has it through our belief in that power and the mind's power over the body. Descartes' mistrust of astrology as a science might well have started at a very early age. Geneviève Rodis-Lewis conjectures that he was introduced to astrological writings at La Flèche as an exercise by Jean François, a young professor there, who later went on to write a treatise against astrology.²⁶² However, it is still not precisely clear what philosophical grounding Descartes might be using to ground this position. Let us first sketch out what I take to be the most obvious response to this question, relating the potential answer to the revolutionary changes he brought about in his theory of causation, then examine just how some of Descartes's most prominent followers explicitly attacked the science of astrology.

I. Mechanism and Astral Influence

²⁵⁹ Descartes to Elisabeth, 18 May 1645 (AT IV, 201). Cf. Aucante (2006), (2000) and Shapin (2000).

²⁶⁰ Descartes's *Passions of the Soul* is very much indebted to his correspondence with both Princess Elisabeth and Queen Christina. His emphasis on the power of the mind over the body seems to stem from the frequent medical discussions between Elisabeth and himself.

²⁶¹ For further disparaging remarks on astrology in Descartes's major works see rule #5 in *Rules for the Direction of the Mind* and the *Discourse on Method*.

²⁶² Rodis-Lewis (1998, p. 10). Yet, on the other hand, another one of Descartes's influences from a young age, Isaac Beeckman, believed in astrological influence and celestial virtue.

To understand exactly why Descartes's could be so obviously taken to be in opposition to astrology we need to very briefly examine some of the scholastic theory that undergirded astral influence according to the astrology of the time. As is well known, in the scholastic philosophy, that Descartes positions himself against, 'causation' was a fairly complex term, which could be subdivided into four different types: material, efficient, formal, and final. Further, the world itself was also subdivided. As is also well known, Aristotelian system required a terrestrial sphere, which was corruptible and finite, and a celestial sphere, which was immutable and eternal. Because these two spheres were fundamentally different in nature, they operated under completely different laws unique to themselves. This also allowed for a relationship between superior and inferior bodies to be established, which would later be used to justify causation between the stars and earth.²⁶³ Needless to say, because of their difference in the kinds of things they are, not all types of causation between the two were allowed—efficient causation was, for the most part, among those ruled out.²⁶⁴ Famously, Descartes, in what becomes termed as the new mechanical philosophy, mostly discards three of the four kinds of causation, leaving himself with only efficient causation to explain all the workings of the physical world. Thus, the various phenomena of the world are broken down to the simple pushing and pulling of different physical bits of matter. This thesis extended to the celestial sphere as well, where, in an act of great

²⁶³ Cf. Weill-Parot's (2010) for an explanation of this relationship in medieval thought, specifically Aquinas or Thorndike (1955). See also Rutkin (2002, p. 41-44).

²⁶⁴ This is an overly simplistic account. There is good reason to believe that "efficient causation" for the Cartesian had a significantly different meaning than it did for the scholastic; see Tuozzo (2014). This being said, "efficient causation" in the Cartesian sense (i.e. only pushing and pullings) seems to indeed be ruled out.

scientific frugality, two realms were reduced to one—all governed by the same laws and explanations.

Of course, astrological explanations were often not this simplistic. Much of Ptolemaic astrology based astrological influence on Aristotle's elements as well as their four qualities: hot, cold, wet and dry.²⁶⁵ Other philosophers incorporated the terrestrial elements as well as celestial influence together to account for a wide variety of phenomena, even the existence of fossils.²⁶⁶ Again, however, these types of explanations are explicitly ruled out by Descartes, or, at the very minimum, require a reduction to size, shape, and motion, which would retain none of the original explanatory power. To adequately account for the diversity in astrological positions, however, would go well beyond the scope of this paper and there is no sufficient reason to believe that either Descartes or his immediate followers who were critical of astrology were very well informed of astrology's governing principles. Thus, taking what we know of Descartes and a rudimentary understanding of astrological causes, there were two immediate results stemming his new outlook on natural philosophy. First, action at a distance, or action between two objects not determined by intermediary substances, was unceremoniously drummed out of the scientific realm. Second, anything normally deemed 'occult,' was equally ruled out, where 'occult' is understood as having qualities, or virtues, which admit of no natural (non-mechanical) explanation.²⁶⁷

So, we can now see two of the seemingly most devastating effects of the new mechanical philosophy against astrology. First, and perhaps most importantly, the

²⁶⁵ Bowden (1975 p. 9-12).

²⁶⁶ See Ariew (2016 p. 37).

²⁶⁷ For a more nuanced view of how the term 'occult' was used, and its shift in meaning from the scholastic to the modern period, see: Hutchison (1982).

status of the celestial bodies is significantly downgraded. Instead of their influence spreading to us through a relationship of superior to inferior bodies, their new role leaves them on par with any other body, including terrestrial ones, thus eliminating a large part of the wonder surrounding astrological prognostications. Second, and partly following from the first, a new problem is introduced: there seems to be no real means for the influence of the stars to reach us, given that their traditional means of causation, formal causation, is no longer allowed. Given that efficient causation is the only acceptable mode of explanation, it would seem to be a bit of a stretch for the stars to be able to, as it were, reach the earth physically. While we cannot be sure that Descartes actually considered this to be an objection to astrology, as his explicit writing on the subject is scant, we can, however, look to the early reception of Cartesian thought where this understanding of the new mechanical philosophy as fundamentally undermining even the possibility of astrological reasoning seems to be quite well represented. If we look at some of the great early Cartesians who worked to further develop Descartes's physical system—namely, Jacques Rohault, Antoine Le Grand, and Pierre-Sylvain Régis—we can see that each specifically targeted astrology along these lines in their major treatises.²⁶⁸

II. Early Cartesian Arguments Against Astrology

While most of their criticisms of astrological methods are similar, it will be helpful to review quickly the principal objections. Rather surprisingly, all three of the above mentioned Cartesians accept influence from the stars to be a given, yet that astral influence is quite explicitly and prudently regulated to merely the light and heat they produce, proportional to their distance from the earth. With the exception of the sun,

²⁶⁸ Le Grand (1694 p. 167-170). Rohault (1723 p. 86).

the influence is considered to be negligible due to the great distances between those celestial bodies and the earth. A yet more powerful argument targeting the scope of astral influence is also consistent throughout the three Cartesians. While the influence of stars is considered negligible, if it were not, the influence exerted upon earth must not be global, but quite specific to location; it is claimed that astrologers had simply disregarded this variable. This argument is supported through varied experiential accounts of various people being born under the same stars yet having different fates, thus experimentally undermining the explanatory value of astrological prognostications. While much of this might strike the modern ear quite favorably, these philosophers are rather consistent in denying any celestial influence and even deny the moon having any significant influence over the earth.²⁶⁹ Rather oddly, common observational reports of the day, including the claim we think true that oysters and some fish are influenced by the moon, are summarily denied, and instead the phenomena are given various other causes in line with Descartes's mechanism (*i.e.*, being better nourished during the time of the full moon, or mere coincidence).

Among these three Cartesians, Rohault's attacks are clearly the most sophisticated. As he describes the situation, astrology suffers from two fatal flaws: first, there is no clear foundation on which to base the required causal mechanisms; and second, there is no clear method to demonstrate that the location of the stars and actions are not simply coincidental and not a true case of causation. As Rohault aptly puts it,

²⁶⁹ This was Descartes's position as well. Strictly speaking, in Descartes physics, it is not the moon that exerts any force on the earth, but merely the pressure of the subtle matter that flows between the moon and the earth. Cf. Aiton (1955).

For, as it would be ridiculous to affirm, that Experience shows us, that *Socrates's*, going out of town, produced thunder, because it was observed to thunder once, at the Moment that this Philosopher was got into the Road to go into the Country: So likewise it is ridiculous to affirm, that we have the experience, that such a particular Constitution of the Stars, produced, for Example, The sickness of a Prince, because it was once observ'd, that a Prince was sick, because they were in such a disposition.

²⁷⁰Already, however, we can see a glimmer of light for the astrologer, or at least a clear set of criteria for what is required for it to be accepted as a legitimate Cartesian science. First, for an explanation of a given phenomena to be accepted, it must be mechanical and rely only on efficient causation. Second, there must be a method for either localizing an astrological prediction or justifying its global scope. Lastly, the influence must be demonstrated to be strong enough to have some quantifiable impact. These challenges are exactly what Claude Gadroys set about to conquer, all while using the very system Descartes and his followers believed incompatible with an astrological science.

III. Claude Gadroys: a Cartesian Astrologist

Not much is known regarding Gadroys's life.²⁷¹ We do know he was born sometime around 1642 and died thirty-six years later in 1678. In various historical dictionaries²⁷² it is claimed that he was trained in scholastic thought, and his first

²⁷⁰ Rohault (1723 p. 89).

²⁷¹ There are a few very brief discussions of Gadroys, the most informative of which are: Thorndike (1934), Mouy (1934), and Clarke (1989). The most extensive discussion, however, occurs in Bowden (1975).

²⁷² See, Chaudon, Louis Mayeul, and Antoine-François Delandine. 1786. *Nouveau Dictionnaire Historique*. Vol. 4. Chez G. le Roi; Ladvoat, Jean Baptiste. 1764. *Dictionnaire Historique-Portatif: Contenant L'Histoire Des Patriarches, Des Princes Hebreux, Des Empereurs, Des Rois Et Des Grands Capitaines*. Vol. 2. Didot; and

publication was a set of “tables pour server à la logique.” He later converted to Cartesian thought, for which he remained a staunch advocate until his death. He served as a *secrétaire* under Louis Bazin de Bezons, who later appointed him as director of the army hospital in Metz, where he died after contracting some illness from one of the patients there. His extant works include a published exchange with M. Castelet regarding the nature of the tides, and another exchange with Guillaume Lamy regarding the benefits of blood transfusions. His two known books are *Le system du monde, selon les trois hypothèse* published in 1675, and the *Discours sur les influences des astres selon les principes de M. Descartes*. The *Discours*, which will be the principal focus of this essay, was first published in 1671 with a second edition following in 1674; although the only difference between the two editions seems to be a subtitle stating, “where it is shown that the stars continually emit a matter by which the things that the ancients attributed to occult influences are explained.” Along with these published works was reportedly an unfinished piece detailing the disagreements between the scholastic philosophy and that of the modern, although, sadly, this work was lost. This was reportedly deeply lamented by Gadroys’s friend, the great Antoine Arnauld.²⁷³

The initial reception of the *Discours* seems to have been quite positive. Interestingly, in 1766, the *Nouveau Dictionnaire Historique* cites Gadroys’s *Discours* as having been “warmly received, as much for its content as for its form;” yet his other works are noted as to be consulted rarely, given that they depend upon Descartes’s philosophy which had been proven false. Later in a 1786 edition of the same dictionary,

Moréri, Louis. 1717. *Le Grand Dictionnaire historique ou mélange curieux de l'histoire sacrée et profane*. Vol. 5.

²⁷³ This note is found in the 1755 edition of the *Dictionnaire Historique Portatif*.

all of Gadroys's work is subsumed under the sad adjective, "guère consulté."²⁷⁴ Opinions on this matter seems to have differed, as, strangely enough, an 1830 edition of *On the Portraits of English Authors on Gardening* claims that Gadroys's *Discours* "surely merits perusal."

The only other documentation that I could find that gives any indication of how Gadroys was received in his day are a few brief mentions in the procès-verbaux of the Académie des Sciences. In February of 1675 Gadroys's second book, *Le system du monde, selon les trois hypothèse*, is mentioned, as he is hoping to dedicate it to the Académie. Later, in March, his epistle is read and approved by the Académie and ultimately appears in Gadroys's *System du monde*. The last entry, in April of 1675, notes that Gardoys presents his book to the Académie. While not much can be gleaned from these brief entries, we can assume Gardoys to be relatively well connected and further that his first treatise on the influence of the stars did not in any way put him out of favor with the Académie.

IV. A Mechanical Argument for Astral Influence: Getting the Stars to Earth

The text of the *Discours sur les influences des astres* itself is broken up into ten chapters, wherein the first five are dedicated to explaining the mechanisms by which the stars' influence can reach the earth, followed by brief discussions of different types of effects this influence can have, including on talismans; Gadroys concludes with his own thoughts on the role of judicial astrology and horoscopes in the "true astrology."

Gadroys's strategy to rehabilitate astrology against its critics starts, in good Cartesian form, by disregarding all that came before it, although as the book unfurls this

²⁷⁴ Rarely consulted.

seems to be fairly disingenuous.²⁷⁵ Throughout the *Discours*, Gadroys is quite keen to cite as many critics and proponents of astrology as he can.²⁷⁶ He also relies extensively on observational reports and common opinions on a great many subjects.²⁷⁷ The most central tenet of Gadroys's system, that we need astral influence to fill an explanatory vacancy, is presented without much argument and is more or less taken for granted. How else, Gadroys asks rather incredulously, could we account for contagious maladies, and diseases in crops?²⁷⁸ However, beyond a variety of such examples and bland assertions regarding the efficacy of astral influence, the majority of the work is set about establishing a basic framework for just how such phenomena are possible, thus directly confronting the objections of his Cartesian contemporaries. To this end, Gadroy finds a means for celestial matter to reach earth in none other than Descartes's own *Principles*. This is of particular interest for several reasons. First, Gadroys wholly adopts efficient causation as the means of astral influence arriving on earth, as he claims that it is the matter from the stars themselves by which they communicate their influence rather than some occult power, thus eschewing a great deal of previous astrological theory. Secondly, Descartes's physics does not offer many possibilities for celestial matter to be transferred over such great distances. Thus Gadroys searching in the *Principles* for a means of communication of celestial matter requires a bit more explanation to fully appreciate the novelty of his approach.

²⁷⁵ Gardoys (1671) *preface*.

²⁷⁶ He is, however, very careful in selecting the passages he cites; the first chapter ends with Gadroys citing both Pico della Mirandola and Gassendi, among others, as agreeing that it is without dispute that celestial bodies do exert influence on the earth (Gadroys (1671, p. 11).

²⁷⁷ Interestingly, in Gadroys' published exchange over the cause of the tides, he is absolutely unapologetic about blindly relying on authority (in this specific case, Giovanni Cassini).

²⁷⁸ Gadroys (1671, p. 8).

In Descartes's physics, as is well known, the entirety of the physical universe is held to be completely full, with no possibility of a vacuum. Therefore, even the planets must be floating along in some kind of matter, and, because the only possible causation is efficient causation, their motion must be explainable in terms of that matter alone. In this completely full world, or *plenum*, each of the planets' particular orbits is explained by describing a vortex of this swirling subtle matter that surrounds them. However, this matter and its interactions must interact in quite specific ways for Descartes's system to function as planned and to account for the accepted observations of the day.²⁷⁹ For example, celestial matter is not allowed to exit these vortices at any point, but, according to Descartes's laws of motion and impact, enter through the poles of a vortex and exit through the equators. This fact is posited to account for the stability of planetary orbits, namely because celestial matter can only enter and exit at certain points, the other areas of the vortex actively resist intrusion, thus not allowing other vortices to shift. If this were not the case, according to Cartesian physics, there would be no sufficient explanation as to why the vortices do not simply combine together into one single vortex.²⁸⁰ Therefore, if Descartes were right, the only location on earth where we might be able to observe significant astral influence would be at the poles and around the equator—an obviously unacceptable result for a practical astrology. Gadroys, however, pulls directly from the *Principles* to show that there must indeed be some transmission

²⁷⁹ Descartes's view of vortices, while perhaps not as well developed as one might like, does seem to take into account a wide variety of possible objections and subtlety. The depth of Descartes's vortex theory is excellently demonstrated in Schuster (2005).

²⁸⁰ This explanation suffers a great deal of criticism and Cartesians generally struggle to account for the permanence of orbits. This culminates in a fairly late but interesting work by Charles-Hercule de Keranflech titled *l'Hypothèse des petits tourbillons* in 1671, which posits smaller and smaller vortices in between the larger ones that serve to keep them separated.

of subtle matter through other points of these vortices by showing an apparent flaw in Descartes's reasoning. In part III of the *Principles*, Gadroys astutely describes Descartes as asserting that celestial matter enters the earth from the area close to the Little Dipper and penetrates through the poles of the earth as part of a larger vortex—thus looping through the earth as a ring through a bead.²⁸¹ Descartes's interest here was to give a mechanical explanation as to why the earth continually maintains its axial tilt toward the Big Dipper. Yet with this innocuous case Gadroys is able to show that celestial matter sent from the Little Dipper must be entering the earth without coming through the poles of the solar vortex, in which the earth's own vortex is contained. This is because the enormous celestial hoop that the vortex from the big dipper through the earth would trace would need to, according to Descartes's own system, pass through many other vortices that would necessarily not be aligned pole to pole,²⁸² therefore, it must be possible for certain types of celestial matter to reach earth.

With this first very large step, Gadroys is able to appropriate the vast majority of Cartesian physics to describe the physical process that allows celestial matter to reach the earth, all while only needing to disregard one apparent contradiction regarding celestial matter passing through vortices, thus retaining the vast majority of Cartesian natural philosophy. However, this alone is not enough to establish a sound Cartesian astrology as the *Discours* sets out to do; what is still needed is an explanation of how the celestial matter is able to affect humans on earth in a meaningful way. For this, Gadroys

²⁸¹ Gadroys (1671 p. 63-55). Descartes, *Principles*, Part III, art. 155 (AT IXb, p. 199).

²⁸² Descartes claims that when two vortices are aligned pole to pole, they will collapse into one vortex. It is only through adjusting his vortices to be perpendicular to each other that Descartes's picture of the universe is able to get off the ground.

again turns to Descartes, but this time, to Cartesian physiology and medicine in *The Passions of the Soul* and *L'Homme*.

V. A Mechanical Argument for Astral Influence: Influencing the Mind/Body Union

I have already noted that Descartes puts much emphasis on the power that the mind holds over the body, but this is only part of Descartes's understanding of the very tight connection between the mind and body. Naturally, because of this union, there is also a great deal of influence that the body holds over the mind. In *L'Homme*, for example, Descartes is quite explicit in explaining exactly how physiological states can produce feelings of joy or sadness:

When the blood travelling in the heart is the most pure and the most subtle, and joins to it more easily than normally, it disposes the small nerve that is there in such a way that is required to cause the feeling of *joy*. As for what is required to cause the feeling of *sadness*, it is when the blood has all the contrary properties.²⁸³

Other more general personality traits are also explained physiologically here—specifically, with reference to subtle matter, called animal spirits, that flows through the blood and brain. The size, shape, and speed that the animal spirits move are enough to cause tranquility of mind, timidity, or kindness.²⁸⁴ Gadroys is all too eager to assimilate Descartes's physiological works into the service of astrology, citing *L'Homme* at length and also drawing heavily from the *Passions of the Soul*.

²⁸³ AT XI, 164-165.

²⁸⁴ AT XI, 166-167. This passage is cited directly by Gadroys on pages 124-126. Similar and more detailed accounts of the various effects of these animal spirits on emotions and temperament can be found in part II of the *Passions of the Soul*.

Without researching the opinions of others, I find that the difference in animal spirits can easily explain the diversity in inclinations. As the spirits excite in us various movements, they give the soul the opportunity to form different thoughts.²⁸⁵

With Descartes's views on mind-body interaction firmly adopted, it is a very short logical jump to show how astral influence can take hold of general personality traits. As Gadroys explains, when a particular planet or star comes into dominance, it sends a larger concentration of its particular celestial matter through its own particular vortex, which, given its particular size, shape, and motion, have various effects on our bodies and consequently our minds.²⁸⁶

Thus Gadroys has answered the principal objections that were typical among the early Cartesians in providing a mechanism by which astral influence can reach earth using Descartes's own principles, and further given a physiological account of how this influence and in turn influence the mind body union. Yet, admittedly, these influence are quite small, as compared to most other terrestrial influences the body endures. Gadroys, however, goes on to bolster his arguments in citing inarguable cases where small causes routinely have quite substantial effects.²⁸⁷ At this point, there is little in the Cartesian system that can be explicitly used against Gadroys as he has taken what was traditionally viewed as an "occult" phenomena and made ample theoretical space for it to be naturalized in good Cartesian form. Of course, Gadroys is not able to answer Rohault's objection to astrology, that correlation does not imply causation, but this is

²⁸⁵ Gadroys (1671 p. 119).

²⁸⁶ Gadroys (1671 p. 151-185).

²⁸⁷ Gadroys (1671 p. 77) brings up the example of a particular cloud formation, which starts quite small, descends, and then spreads out to great effect.

simply not Gadroys goal in this essay. He is quite explicit that he contents himself to have described the foundation and leaves it to others to carry out the necessary observations and experiments to fully complete a true astrological science.²⁸⁸

VI. Cartesian Limitations: Free Will and Causal Interference

Up to this point we have seen a fairly ingenious and comprehensive take on Descartes's natural philosophy to answer some of the major objections against astrology. Gadroys has provided, in a fair amount of detail, a reasoned mechanism for not only how the stars' influence can reach earth, but also a physiological account of how that influence can actually have substantial effects on us. All this seems quite in line for Gadroys to eventually accept the practicality of judiciary astrology and to pave a way for a true science of horoscopes and the like. However, in the final chapter of the *Discours*, Gadroys shows immense restraint and moves away from Descartes's natural philosophy to delve into his metaphysics as well. Returning to an objection from Aquinas addressed earlier in Gadroys's *Discours*, he meets head-on the paradoxical nature of the free will in the face of what appears to be a deterministic physics and a mechanistic system of astral influence acting on the body and then, necessarily, the mind. Descartes, quite famously, asserts that despite the implications of his mechanistic physics, free will is a fact that we all clearly experience, thus have no need of rigorous proof to fully accept. Even if reason and experience lead us to a deterministic physics, free will simply cannot be denied; Gadroys agrees. This being the case, according to Gadroys, the scope of any true astrology cannot be absolute. Further, if astrology were able to determine the fate of

²⁸⁸ Gadroy (1671 p. 218).

mankind, morality would be destroyed, as no one would be either praiseworthy or blameworthy—an unacceptable result.²⁸⁹

Continuing to acknowledge the force of arguments against astrology, Gadroys admits that astral influence is no different than any other influence that can be found on earth, thus accepting the general Cartesian objection discussed above.

Human nature is so supple, so malleable, and so susceptible to diverse forms, that in the course of our life the example of a friend, meeting a single man, can incline us to good or evil.²⁹⁰

Noting the equal causal powers of our everyday surroundings and the stars, Gadroys again restricts astrology's reach, while still carving out a space for it among acceptable Cartesian explanations. Gadroys asserts that our actions are dependent on three things: God, our will, and other beings, where stars and planets are contained in the third category. Here, Gadroys, as an astute reader of Descartes, goes beyond what he found in his works and attempts to develop the Cartesian tension between free will and a deterministic physics further than Descartes had ever attempted, allowing influence without any necessary causation.

Given the complex network of causal interactions, Gadroys makes what surprisingly seems to be one of the strongest claim against astrological predictions from any Cartesian: "Thus it is a criminal temerity to pretend to pierce the thick clouds of the future: our eyes are too weak, and time is a veil too obscure."²⁹¹ However, again, claiming this inherent complexity in nature and the weakness of our own abilities to comprehend it all is not to say that astrology has no place at all in science *tout court*—

²⁸⁹ Gadroys (1671 p. 207).

²⁹⁰ Gadroys (1671 p. 202).

²⁹¹ Gadroys (1671 p. 214).

quite to the contrary, it is claimed to be a very rich area for further research.²⁹² The purpose of a true science of astrology, therefore, is to generate weak and general judgments, knowing full well that they hold no absolute certainty over our actions.²⁹³ This, of course, does not exclude astrology from the realm of science, understood as a Cartesian, instead it merely limits it to a morally certain science, which, after all, constitutes the vast majority of Descartes's own *Principles*.

What then can we take away from this curious case of Claude Gadroys? One thing is certain: when Descartes claimed in the French edition of his *Principles* that he could explain how wounds could be caused to bleed when the murderer approached, precognition, or other such rare marvels, with his basic principles alone, he opened the door for a wide variety of seemingly occult phenomena becoming naturalized.²⁹⁴ Astrology, so it seemed, had this door opened to it as well. As is noted in Bayle's *Nouvelle de la République des lettres*:

Who would have believed that the philosophy of Mr. Descartes, which was the bane of superstitions, should be the best support for astrologers and enchanters? Mr. Gadrois, a good Cartesian, has already shown that there is no system more favorable to astrology than that of Mr. Descartes.²⁹⁵

Indeed, Gadroys's Cartesian defense of astrology seems to have given the subject the cutting edge scientific background it so desperately needed to rehabilitate itself. However, Gadroys's work seems, despite its ingenuity, to have had no substantial impact that I could find, and being so closely intertwined with Descartes's own physics,

²⁹² Gadroys (1671 p. 218).

²⁹³ Gadroys (1671 p. 214-215).

²⁹⁴ *Principles*, Part IV, art. 187 (AT IXb, p. 308).

²⁹⁵ *Nouvelle de la République des lettres* April, 1686: 426.

suffered the same unfortunate fate. In that same light, however, I can think of no better embodiment of Pierre Daniel Huet's objection that Descartes's system proves too much.²⁹⁶

If you were to ask Descartes how Saturn comes to have a great circle that is detached from Saturn surrounding it, he would first derive the cause of this effect from the great store of causes he had prepared. But these causes are such that you could conclude that all the other planets should be surrounded in similar rings.²⁹⁷ Indeed, because Descartes's system was designed first to set the foundation for possible scientific explanations and only after experiment to determine which explanation is in fact correct, this objection might well have been seen as a novel feature by Descartes and Gadroys. However, in the end, Gadroys, in good Cartesian form, describes only the foundation and refuses to follow through with the experimentation and observation required to adequately ground his theory, thus he reduces his work to a curious tale in the extremes of Cartesianism.

²⁹⁶ These types of objections were not uncommon, see Roux (2008).

²⁹⁷ Régis and Huet (1691 p. 303).

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