Descartes' *Cogito*

Saved from the Great Shipwreck

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The Prolegomena to Any Future Epistemology

In 1628, Rene Descartes received an invitation to a meeting at the home of Cardinal Bagni, papal nuncio. Descartes brought with him Father Mersenne, a Minim friar, and M. de Ville-Bressieu, a physician of Grenoble. This was no ordinary meeting. It consisted of well-known *honnets gens* of Paris. They had met to hear a famous doctor-chemist by the name of Chandoux. Chandoux was an expert on base metals who three years later was to be executed for peddling fake currency. Chandoux, charming and fluent, was denouncing the verbiage of scholastic philosophy as it was usually taught in the Schools. There was little new in what he said, for it was mostly in the vein of Francis Bacon, Pierre Gassendi, and Thomas Hobbes. Yet he wanted his system of philosophy to appear fresh and novel. Whatever Chandoux said, everyone applauded. That is, everyone save Descartes.

The founder of the oratory, and perhaps the most powerful religious thinker of the Counter-Reformation, Cardinal Berulle, observed this. He asked Descartes what he thought of Chandoux's speech that had so thrilled the audience. Descartes demurred, saying "that he could not speak in opposition to the feeling of the *savants* present."[1] But the Cardinal did not relent. At last, Descartes spoke. He began by praising Chandoux's denunciation of scholastic philosophy. But then he argued against the speaker and "that great and learned company" for

[1] Elizabeth S. Haldane, *Descartes: His Life and Times*, 108. The details of the references are given in the bibliography.

taking *probability* as the central notion and not the notion of *truth*. If one were satisfied with something merely probable, he argued, then one could easily take false statements to be true and true statements to be false. As evidence, he asked that someone in the audience propose what he deemed to be an incontestable truth. Someone volunteered, and Descartes proceeded to show in twelve arguments, relying on the notion of probability, that the proposed statement was false.[2] He then asked that someone propose a statement that he took to be incontestably false. Once again, with reasoning by probability as his guide, he showed the statement to be true. He thus demonstrated that our minds can become victims of the notion of probability. The audience was duly stunned, and some openly deserted Chandoux on the spot.

The *savants* begged to know if there was a method, "some infallible means to avoid these difficulties." Descartes replied that there was his own method. "I made the whole company recognize what power the art of right reasoning has over the minds of those who have no learning beyond the ordinary, and how much better founded, and more true and natural, my principles are than any of those which are currently received in the learned world" (CSMK, 32; AT I, 213). Such a method would be useful not only in metaphysics, but also in mechanics and medicine. Cardinal Berulle, whom the young philosopher met with privately shortly afterward, was impressed beyond words. With the full weight of his ecclesiastical authority, he urged Descartes to write and publish his views, on the ground that he, Descartes, "was responsible to God for giving to mankind what had been delivered to him."[3] Thus was born, some nine years later, *Discourse on the Method* – and with it, the history of modern philosophy.

[2] On October 5, 1637, Descartes wrote to Father Mersenne, complaining that Fermat had misunderstood him: "He thought that when I said that something was easy to believe, I meant that it was no more than probable; but in this he has altogether mistaken my meaning. I consider almost as false whatever is only a matter of probability; and when I say that something is easy to believe I do not mean that it is only probable, but that it is so clear and so evident that there is no need for me to stop to prove it." (CSMK III, 74; AT I, 450–451)

[3] Elizabeth S. Haldane, *Descartes: His Life and Times*, 110. Alas, the private meeting with Cardinal Berulle – Haldane undoubtedly got it from Adrien Baillet's (1649–1706) *La Vie de Monsieur Descartes*, the first biography of Descartes – has been contested by Genevieve Rodis-Lewis in her marvelous book *Descartes: His Life and Thought*. (See R, 67–69 and 240, note 21, for further details on this episode.)

Granting the possibility of knowledge, what kind of person can pursue and possess knowledge? Descartes thinks that only a certain kind of person can, or at any rate should, embark on the pursuit of knowledge and come to possess it. Section I of this chapter delineates the making of such an ideal knower, who should be armed with a method in his pursuit, like a traveler who ought to carry a map on his journey. Section II provides just such a rationalist method. Section III presents Descartes' famous tree of philosophy: This is Descartes' view of what the completed structure of science would look like. Finally, section IV presents the moral code a pursuer of knowledge should abide by, and I raise the question of whether Descartes is attempting, in this endeavor, to raise himself by his own bootstraps.

I. The Making of an Ideal Seeker

It is our modern liberal view that anyone, man or woman, of any station in life, can embark on studying any discipline, at any time, and at any place, and that what he or she learns will depend on how hard he or she works. There are no other restrictions. This view was not always held. Descartes, for instance, did not hold it. He thought not only that it was necessary for a person to possess certain intellectual and emotional qualities, but also that he had to undergo an initial period of preparation before he could finally embark on a strenuous philosophical inquiry.

Descartes became aware only very slowly of the problem of the ideal seeker. In *Rules for the Direction of the Mind*, composed around 1628 and published posthumously, Descartes was hardly aware of the problem, even though he had said, "Where knowledge of things is concerned, only two factors need to be considered: ourselves, the knowing subjects, and the things which are the objects of knowledge" (CSM I, 39; AT X, 411). Descartes had scarcely said anything in this work about the knowing subject as an ideal inquirer. But in *Discourse on the Method*, first published anonymously in 1637, he was quite interested in that problem. That issue was shelved, or at best the solution presupposed, when he came to write the *Meditations on First Philosophy*, published in 1641. It was once again in the limelight in the unfinished dialogue *The Search for Truth*, composed, according to one authority, sometime

during the last seven years of his life.[4] (There is an interesting parallel in his treatment of mathematics. Descartes assumed the truthfulness of mathematical statements without question in the *Rules for the Direction of the Mind*, but in subsequent works, such as the *Meditations on First Philosophy*, he felt he could no longer make that assumption and tried, as we know, to justify even those truths.)[5]

My aim in discussing this issue is threefold. First, I want to give prominence to a historical issue that has been cast aside, if occasionally noticed. Second, I want to focus afresh on the problem of the reliability of reason. Third, and far more importantly, I hope to show that a proper understanding of the nature of the ideal seeker in Descartes will provide us with one powerful argument, among others, in defense of the central thesis of this book.

From Sextus Empiricus to Michele de Montaigne, the problem of the ideal seeker is hardly in the background. These philosophers had concerned themselves with the problems and pitfalls facing an ordinary seeker. Concerned as he was to respond to the skeptic, it is scarcely surprising that Descartes should have said much that revolved around this topic – although it *is* surprising that he never explicitly discussed the issue, by this name or any other. In what follows, I am clearly offering a reconstruction, namely, a systematic reconstruction of an answer, based on the Cartesian texts, to the question, "How is an ideal seeker made?," as if Descartes had explicitly chosen to ask and answer that question.

An ideal seeker after truth has to pass through four stages.[6] The first stage consists of his "original state of ignorance" (CSM II, 413; AT X,

[4] For other conjectures see R, 196–197, note 6.

[5] See C, 35–38. That Curley overstates the case by underplaying the method presented in *Rules for the Direction of the Mind* and overplaying the method presented in the *Discourse on the Method*, and in subsequently published works, does not detract from what he says about Descartes' evolving view of both method and mathematics.

[6] Since this is admittedly a reconstruction, my primary task is to invite the reader to consider not only whether Descartes clearly delineated the four states, but also his thinking that the ideal seeker passes through these states as if they were stages in a progressive order. Descartes did not explicitly develop the notion of an ideal seeker and put it to epistemic use, nor did he take a stand, for or against, on a progressive order of such states, since he did not treat this issue explicitly. However, there is some historical evidence to suggest that the proposed reconstruction is not entirely alien to Descartes' philosophy; indeed, it might be seen to play a vital role in it. See, for example, the final chapter of this book, pages 266–267 and notes 31 and 32.

519).[7] Initially, everyone belongs in this group. Out of this group are sifted those desiring to be seekers after truth from the others who have no such desire; given their dispositions, the nonseekers are unsuited for the philosophical task. This constitutes the second stage. From the group of those desiring to be seekers are distinguished, on the basis of certain right qualities, potentially ideal seekers from those who are not. This is the third stage. These potentially ideal seekers have finally to undergo preparation – study and reflection – in the fourth and last stage, as a way of making them ideal seekers before actually commencing the philosophical task.

The *first* stage, *the original state of ignorance*: "[A]s regards reason or sense," says Descartes, "since it is the only thing that makes us men and distinguishes us from the beasts, I am inclined to believe that it exists whole and complete in each of us" (CSM I, 112; AT VI, 2).[8] Then it would appear that anyone, at the start, is fit for the task of philosophical inquiry; but there are hindrances. Each normal person, at birth, has the senses of taste, smell, touch, sight, and hearing fully and dominantly functioning in him; reason, at this point, plays a small and subservient role. Here commences the growth of "the first obstacle" (CSM II, 406; AT X, 508). For the senses are essentially imperfect: They often deliver false reports about the external world; our inclinations are quite corrupt, our nurses foolish; our appetites and teachers are opposed, our instincts blind. Thus, we are all in the original state of ignorance, and the problem is how to emancipate ourselves from it so that we may become fit truth seekers.

The *second* stage, *the stage of sifting*: There are two types of individuals – "types of minds" – who are clearly unsuited for philosophical inquiry.

> First, there are those who, believing themselves cleverer than they are, cannot avoid precipitate judgements and never have the patience to direct all their

[7] In the letter of February 27, 1637, to Mersenne, Descartes wrote, "I was afraid that weak minds might avidly embrace the doubts and scruples which I would have had to propound and afterwards be unable to follow as fully the arguments by which I would have endeavoured to remove them. Thus I would have set them on a false path and been unable to bring them back." (CSMK, 53; AT I, 350) Scholars are not agreed on the exact date of this letter.

[8] "[F]ew," wrote Descartes to Mersenne on October 16, 1639, "are capable of understanding metaphysics." (CSMK, 65; AT II, 596) It must follow that the final group of inquirers after truth would be inordinately small.

thoughts in an orderly manner; consequently, if they once took the liberty of doubting the principles they accepted and of straying from the common path, they could never stick to the track that must be taken as a short-cut, and they would remain lost all their lives. Secondly, there are those who have enough reason or modesty to recognize that they are less capable of distinguishing the true from the false than certain others by whom they can be taught; such people should be content to follow the opinions of these others rather than seek better opinions themselves. (CSM I, 118; AT VI, 15)

In short, none of these men are "of a fairly robust intellect" (CSM II, 320; AT VII, 475).

Descartes' fear of losing an individual in the morass of doubt was a genuine one. For him, knowledge was a guide to action, and actions were necessary to the making of a good person. Thus, ignorance and confusion could easily produce poor or evil deeds. Even a good method could produce, in someone incompetent, a bad person. This result must be avoided at all cost. For learning is of secondary importance in comparison to good deeds.

A good man is not required to have read every book or diligently mastered everything taught in the Schools. It would, indeed, be a kind of defect in his education if he had spent too much time on book-learning. Having many other things to do in the course of his life, he must judiciously measure out his time so as to reserve the better part of it for performing good actions – the actions which his own reason would have to teach him if he learned everything from it alone. (CSM II, 400; AT X, 495–496)

The moral risks are plainly too high for anyone who is incompetent to embark on the kind of enterprise Descartes has in mind.

Who, then, is fit for the philosophical task? I am attempting to search for minimal conditions or qualities that a person must possess, in Descartes' view, in order to perform that task; anyone who possesses anything more is more than qualified. In short, I am looking for necessary conditions, jointly adding up to a sufficient condition, that would make a person an ideal seeker.

The *third* stage, *the stage of determining the right qualities*: The ideal seeker must be someone of at least average intelligence, who has reached the age of discretion, whose senses are in good condition, who is blessed with a modicum of insight and has common sense; this eliminates the necessity of having gone to School (and thus having

received training in grammar and logic). Peter Ramus, whose logical system Descartes had studied, had defined such a person as a syllogistic reasoner, and not just as a reasoner. So in Ramus' view an ideal seeker would be essentially equipped with syllogistic reasoning. Not so for Descartes; he maintained that he had never presumed his own mind "to be in any way more perfect than that of the ordinary man" (CSM I; 111, AT VI, 2).[9] Descartes would have been quite pleased with John Locke's remark that "God has not been so sparing to men to make them barely two-legged creatures, and left it to Aristotle to make them rational, i.e., those few of them that he could get so to examine the grounds of syllogisms."[10]

The ideal seeker must have a quick wit, a sharp and distinct imagination, ample and prompt memory, and the strongest ability to reason; he must be skilled at ordering his thoughts, troubled by no cares or passions, and capable of seeing clearly into his own actions; he must not be precipitate in his judgments, nor influenced by custom and example; he must allow adequate time in planning his work, and proceed confidently in this life. Only such an ideal seeker will persevere unswervingly in this task and eventually discover the truth, and having

[9] This was no mere false modesty. It was typical of the newfound confidence in reason and the belief that reason, whole and complete, was universal in man. Descartes conducted himself accordingly. Thus, he taught his servant, Jean Gillot, and Dirk Rembrandtsz, a cobbler, mathematics; the former became director of an engineering school at Leiden. Noting his talents, Descartes hired Henry Schulter as his manservant, so that Schulter might assist him in his experiments. The captain of a ship on which Descartes had traveled was so impressed with Descartes' vast knowledge of meteorology that when they reached Stockholm, the captain boasted to Christina that Descartes had taught him more in three weeks than he had learned in sixty years at sea. Clearly, Descartes' theory belied his practice: Ordinary people, without any formal learning, can learn difficult and important things. Perhaps this was the net result of his Jesuit education: "The equality the Jesuits established among [the students]," he wrote, "hardly treating the highest born any differently from the most humble, was an extremely good invention" (R, 11; see also vii, 184–186).

The provisional title of *Discourse on the Method* was *Project for a universal science which might raise our nature to its highest degree of perfection. Next the Dioptric, the Meteors, where the most curious matters which the author could find to give proof of the universal science he proposes are explained in such a manner that even those who have never studied can understand them.* He suggested that an ideal seeker should be at least twenty-four years old (CSMK, 120; AT II, 347), because "the younger they are, the less liberty they have," due to the soft nature of their brains (CSMK, 190; AT III, 424), which makes them unfit for learning.

[10] John Locke, *An Essay Concerning Human Understanding*, Volume 2, p. 391.

discovered it, be able to persuade others of it. Such seekers will be able to persuade "even if they speak only low Breton and have never learned rhetoric" (CSM I, 114; AT VI, 7).

There might be a conflict of propositions here. In the "Fourth Set of Replies," Descartes had warned that the *Meditations on First Philosophy* should be studied only "by very intelligent and well-educated readers" (CSM II, 172; AT VII, 247). One might conclude that Descartes had not made up his mind whether he wanted his ideal seeker to be just intelligent, like Polyander in *The Search for Truth* (in which Polyander is to Eudoxus what the slave boy was to Socrates in *Meno*), or whether he wanted an ideal seeker who was very intelligent. Again, did Descartes want his ideal seeker to be initially without education, as Polyander was? Or did he want the ideal seeker to be someone initially with a solid education? And yet, says an excited, marveling Eudoxus, who has taken Polyander through the *cogito*, "Would you have thought that an uneducated man who had never bothered to study could reason with such precision, and be so consistent in all his arguments?"[11] (CSM II, 415; AT X, 522) Obviously, being well educated is not a necessary condition for being an ideal seeker. Descartes is concerned, in his "Fourth Set of Replies," to fend off the objection that his method of doubt will engender doubt in the believers, and turn many a person away from the truths of faith. Descartes' counter would have been that such men, if they turned away from their faith, would be precipitate in their judgment and hence would not qualify as ideal seekers.

It is not clear whether the qualities that a person possesses, such as the qualities of quick wit, prompt memory, and sharp imagination, or the qualities of being precipitate in one's judgments and having modest reasoning abilities, are essential properties or accidental ones. If merely accidental, then those eliminated at the stage of sifting can

[11] Since this is of some importance later, I cite the historical root of this approach. In the Prologus of Raymond Sebond's *Natural Theology*, written in the 1420s or early 1430s, Sebond wrote: "And there is no need that anyone should refrain from reading it or learning it from lack of other learning: it presupposes no knowledge of Grammar, Logic, nor any other deliberative art or science, nor of Physics nor of Metaphysics. . . ." (Appendix II, in Michele de Montaigne, *An Apology for Raymond Sebond*, xli–xlii) Such was the man Polyander; such was the ideal seeker who could be persuaded of what Descartes was trying to persuade him.

return to the fold by appropriately training themselves, acquiring the necessary prerequisites to be an ideal seeker. If essential, then the set of ideal seekers constitutes a natural class; genuine knowledge seekers would be born, not made. Inasmuch as Descartes maintains that reason exists in each person whole and complete, he must maintain the more realistic doctrine, as follows: All persons are capable of discovering the truth, some more than others. Those who make poor seekers are those in whom reason is clouded by a host of contingent factors over which they have little control.

"Having thus prepared our understanding to make perfect judgments about the truth, we must also learn to control our will by distinguishing good things from bad, and by observing the true difference between virtues and vices" (CSM II, 405; AT X, 506). This is putting the cart before the horse: One cannot prepare the understanding to make perfect judgments without the will; if the will is not in control, it will make poor affirmations or denials. I find it surprising how very little Descartes says about the will in the earlier portions of either the *Meditations on First Philosophy* or the *Discourse on the Method*, given its central importance in his epistemology. For one thing, it is only the will's affirmation that introduces the question of truth or falsity into the discussion. Without the will, such questions cannot arise, and so knowledge seeking cannot proceed apace without the will. Descartes speaks of the intellectual qualities of the seeker, of the morals he should adopt while engaged in his philosophical quest, but there is virtually nothing about the will or the goodness of the will, how it should be controlled and trained, and so on, in order that it may act without error.[12]

The *fourth* stage, *the stage of preparation*: The potentially ideal seeker does not jump into making philosophical inquiries, not yet. He has to prepare himself. He travels and gathers experience of men and the world; he moves in the company of gifted men. (He reads books; and, as a daily routine, he engages in the study of mathematics. These clearly

[12] Why not think, one might ask, that the will is trained through enacting the analytic method of the *Meditations*? I have two reservations: First, there is *no* evidence that Descartes intended that; second, if the will – of a mature individual – is to make appropriate choices as it wades through the *Meditations*, would it not already have to possess goodness, say, if it is not to run afoul and choose erroneously? As an antidote to my reservations, see the splendid Chapter 2, "Descartes: Willful Thinking," in Michael Losonsky, *Enlightenment and Action from Descartes to Kant: Passionate Thought*.

go far beyond the necessary conditions for the making of an ideal seeker. Descartes did these things, but he did not make Polyander, his example of an ideal inquirer, do them.) Thus, the ideal seeker trains his mind, deepens it, makes it more powerful, so that when he finally embarks on his philosophical inquiries he will be a person whose mind is properly balanced between intellectual and emotional matters, and his will will be strong and clear. This, then, is the nature of the ideal seeker, and this is how he is made.

Polyander says, "I am a man who has never engaged in study or accustomed himself to turning his mind so far away from things that are perceivable by the senses" (CSM II, 408; AT X, 512). Epistemon, a bookish man, asserts, "I agree that it is very dangerous to proceed too far in this line of thinking" (CSM II, 408; AT X, 512). Eudoxus (playing the role of Descartes) counters thus: "I confess that it would be dangerous for someone who does not know a ford to venture across it without a guide, and many have lost their lives in doing so. But you have nothing to fear if you follow me." (CSM II, 408; AT X, 512) A strong and bold explorer can lose himself without a guide; a man of common sense and discretion can lose himself, too, without someone to guide him in his search for knowledge. Thus, even the ideal seeker needs a guide, a method.

II. The Method: The Rationalist Thread

If Descartes had been asked, "What is the aim of science?," he no doubt would have replied, quite simply, "The absolute truth." He took truth to be indefinable, but he might have granted the following distinction. There is phenomenal truth, $truth_p$, and there is rational truth, $truth_r$. When we combine $truth_p$ and $truth_r$, we get absolute truth. What, then, are these two species of truth? Descartes wanted our theories of the world to at least match our experiences and experiments. The theories should "enable us to explain all natural phenomena [i.e., the effects that we perceive by means of our senses]" (CSM I, 248; AT VIIIA, 80). Such theories are $true_p$. What cannot explain the deliverances of our sense experiences is, at a minimum, not phenomenally true, and hence not absolutely true.

Now, it is entirely possible for two theories to be $true_p$, that is, phenomenally true, without their being $true_r$, that is, rationally true.

Descartes gives a simple example to illustrate this (what philosophers now call the empirical equivalence of theories).

> However, although this method may enable us to understand how all the things in nature could have arisen, it should not therefore be inferred that they were in fact made in this way. Just as the same craftsman could make two clocks which tell the time equally well and look completely alike from the outside but have completely different assemblies of wheels inside, so the supreme craftsman of the real world could have produced all that we see in several different ways. (CSM I, 289; AT VIIIA, 327)

A theory is determined to be true_r if it appears true when viewed in the natural light of reason. Such, for example, are the truths of logic, mathematics, and metaphysics. The true_r theory will correctly describe how the wheels are assembled within. The true_p theory will correctly describe how the two clocks look and how they tell time. In other words, granting that the supreme Craftsman could have devised various hidden mechanisms to produce the same observable effects, then the true_p theory will explain all of the observable effects, and the true_r theory will capture the veiled internal mechanism of the world that produces these effects, and that truth will be unmistakably exhibited to the natural light of reason. Thus, an absolutely true theory not only will get the phenomena right – it will be true_p –, but also will get the mechanism right – it will be true_r.

One might worry that the foregoing is a less-than-exhaustive way of describing Descartes' own problem-situation, because of the problem posed by the micromechanical, that is, that which we do not directly perceive by sense, but which is visualizable. There seems to be a tension in Descartes between the idea that underlying structures are fully determinate and could be perceived with good microscopes, and the idea that they can be approached only by "reason", that is, by model making and intramental model comparison and exclusion. It is still, one might suppose, a very live question whether rational truth just stands in provisionally for the micrographic, or whether subvisible structures are still just phenomenal truth and ultimately have to be supplanted by nonvisualizable rational truth.[13]

[13] I owe this objection to Catherine Wilson.

I have no fully satisfactory answer – certainly none that is historically satisfactory – to allay this worry, save this: Drawing on a common antirealist position, I would say that there does not appear to be a third type of truth. Let us say that a model depicts a microphenomenon. Then, the model is to be viewed either as a truth_p or a truth_r. If it is not regarded as a truth_p, it may for a while have an uncertain status, until it is explained or "approached" by reason. If the model has some sort of truth not characterized by either of these kinds of truth, I am not able to determine what it might be that would cohere with Descartes' method and metaphysics. Finally, if the underlying structures are fully determinate, and we can "approach" them only vis-à-vis our model making, never quite getting at the underlying reality, then this can easily be shown to lead to a kind of skepticism from which Descartes cannot be saved.

For Descartes, science was systematic knowledge: neither a patchwork quilt, nor a mere network, of propositions. It was built on a rational foundation and not on guesswork or conjecture; it was indubitable and nothing less. Given the aim of science, there was a method to match. "I formed a method whereby, it seems to me, I can increase my knowledge gradually and raise it little by little to the highest point" (CSM I, 112; AT VI, 3). What was this method?

But first, what exactly did Descartes mean by *method*?

> By a 'method' I mean reliable rules which are easy to apply, and such that if one follows them exactly, one will never take what is false to be true or fruitlessly expend one's mental efforts, but will gradually and constantly increase one's knowledge till one arrives at a true understanding of everything within one's capacity. (CSM I, 16; AT X, 371–372)

Descartes was not offering a method whose set of rules could be mechanically applied in order to churn out new and novel truths. If that is what is meant by a method – an algorithm – then Descartes did not offer a method. A truth table is an algorithm used to determine if an argument in propositional logic is valid; a Venn diagram is an algorithm used to determine if any of Aristotle's 256 categorical syllogisms is valid. Descartes is not offering anything remotely similar. This does not prevent him, like most current philosophers of science, from being optimistic and claiming that if his method is adopted, then the likelihood of discovering more and more scientific truths, the discovery of

which lie within the province of human capacity, is far greater than the likelihood of discovering such truths using any alternative method.

These, then, are the four major rules of Descartes' method:

> The first was never to accept anything as true if I did not have evident knowledge of its truth: that is, carefully to avoid precipitate conclusions and preconceptions, and to include nothing more in my judgments than what presented itself to my mind so clearly and so distinctly that I had no occasion to doubt it.
>
> The second, to divide each of the difficulties I examined into as many parts as possible and as may be required in order to resolve them better.
>
> The third, to direct my thoughts in an orderly manner, by beginning with the simplest and most easily known objects in order to ascend little by little, step by step, to knowledge of the most complex, and by supposing some order even among objects that have no natural order of precedence.
>
> And the last, throughout to make enumerations so complete, and reviews so comprehensive, that I could be sure of leaving nothing out. (CSM I, 120; AT VI, 18–19)

The first two rules are primarily rules of analysis. Essentially, they maintain the following: (i) Keep doubting a proposition until you have no occasion to doubt it (otherwise, by implication, reject it). Such a method of doubt will lead one to reject not only hasty conclusions but also vague, untested conceptions or preconceptions, such as the notions of vacuum, gravity, and substantial forms. (ii) Divide the given problem into several smaller, yet clearly more manageable, problems. The requisite analysis should be carried *to the limit*, so that the solutions of the smallest and simplest problems can better lead to the solution of the larger problem with which the analysis began. (iii) Accept as true only that which presents itself to the mind as clear and distinct. The combination of (i) and (iii) will yield certain knowledge and not merely probable knowledge.

Perhaps one can now more sympathetically appreciate Descartes' reaction to Galileo. On October 11, 1638, Descartes wrote to Mersenne, "It seems to me that he [Galileo] lacks a great deal in that he is continually digressing and never stops to explain one topic completely, which demonstrates that he has not examined them in an orderly fashion and that, without having considered nature's first causes, he has sought only the reasons for a few particular effects, and thus he has built without foundations" (V, 115). This was no case of sour grapes. In terms of the foregoing, Descartes was complaining that Galileo had

proceeded in a disorderly fashion, that he had tried to explain a few particular effects without taking his analysis down to the deepest level. Thus, Galileo had failed to uncover the basic axioms of his science of physics, which would have enabled him to explain not just the particular effects, but all of the facts in the given domain of knowledge.[14] Moreover, it was only the truth and certainty of the axioms of physics that would have given firm anchor to Galileo's science. Galileo had failed in that respect, and hence had "built without foundations". This, then, is the structure of discovery, not just in physics and geometry but in any field of knowledge.

Next, consider rules 3 and 4 of the method. These are primarily the rules of synthesis. Essentially, these rules maintain the following: (i) Assume, even if perhaps contrary to appearance, some natural, not man-made, order among the objects of your investigation. One might ask, "Isn't Descartes saying that one has to impose an order by deciding what to take up first, even if there is no natural order?" Well, Descartes wrote to Mersenne on May 10, 1632, while absorbed in the study of astronomy, "For although [the stars] seem very irregularly distributed in various places in the heavens, I do not doubt that there is a natural

[14] Sir Karl Raimund Popper has objected that just such a structure of knowledge as Descartes was proposing was obscurantist in its demand for ultimate explanations in terms of essences; see his *Conjectures and Refutations: The Growth of Scientific Knowledge*, in particular Chapter 3, section 3. Popper states, "Thus my criticism of essentialism does not aim at establishing the non-existence of essences; it merely aims at showing the obscurantist character of the role played by the idea of essences in the Galilean philosophy of science" (105). Popper fears that if essences are postulated, as in Galileo (or in Descartes), useful questions will not be asked (106), and this will prematurely stop the flow of knowledge.

This need not be so. There is nothing inherently wrong in the doctrine of essences; in any event, it is compatible with the doctrine of conjectures and refutations. Thus, no one who postulates essences, described at one level, need claim that he has in fact discovered those essences. He may simply regard himself as being at an earlier level, awaiting further descent into deeper and deeper worlds described at the corresponding levels. In Popper's words, "the world of each of our theories may be explained, in its turn, by further worlds which are described by further theories" (115). Such a philosopher, like Descartes, is simply proposing what the structure of knowledge should look like, *when* there is knowledge at hand. To claim that there *is* knowledge at hand, Descartes proposed a different theory. The former is an ontological claim, the latter an epistemic one, and the two can rest side by side, at ease with each other. Descartes, more than any other philosopher in the history of philosophy – Francis Bacon included, in my view – was the one who determined, for a long time, what was to be regarded as the structure of knowledge.

order among them which is regular and determinate" (CSMK, 38; AT I, 250). I suspect, then, that Descartes' reply to the foregoing question would be twofold: First, there *is* a natural order in the world, and second, often we discover that natural order by starting our search by imposing a conjectured order on the system we are investigating. (ii) Begin with the simplest and most easily known objects that precede the rest of the objects in the order. "[W]e term 'simple' only those things which we know so clearly and distinctly that they cannot be divided by the mind into others which are more distinctly known" (CSM I, 44; AT X, 418). (iii) Ascend to the more complex objects in the order in a slow step-by-step manner, via less complex objects, the steps being dictated by the rules of the subject matter at hand. (iv) Omit nothing by enumerating everything that lies within the domain of your subject matter.[15] Finally, (v) carry out comprehensive reviews and enumeration.

This method of analysis presupposes that we can analyze a problem, break it down into simpler units, like building blocks, without the aid of a theory, a perspective. It presupposes that there is only one unique way of breaking down the problem, that there is a "best order" in which all items can be arranged. But this is quite an implausible assumption, at least as a general statement. There are as many ways of analyzing a problem as there are ways of viewing the objects in a domain, and there are generally quite a few ways of viewing a given set of objects. That this presents a difficulty for Descartes is not hard to see. If the perspective is granted, then the analysis can be carried out. But that leaves the correctness of the perspective in question. For if the

[15] "I said also that the enumeration must be well-ordered. . . . if we arrange all the relevant items in the best order, so that for the most part they fall under definite classes, it will be sufficient if we look closely at one class, or at a member of each particular class, or at some classes rather than others. If we do that, we shall at any rate never pointlessly go over the same ground twice, and thanks to our well-devised order, we shall often manage to review quickly and effortlessly a large number of items which at first sight seemed formidably large." (CSM I, 27; AT X, 390–391)

To quote in full rule 5 of *Rules for the Direction of the Mind*: "The whole method consists entirely in the ordering and arranging of the objects on which we must concentrate our mind's eye if we are to discover some truth. We shall be following this method exactly if we first reduce complicated and obscure propositions step by step to simpler ones, and then, starting with the intuition of the simplest ones of all, try to ascend through the same steps to a knowledge of all the rest." (CSM I, 20; AT X, 379)

perspective were false or poor, the analysis would be worthless. On the other hand, if the perspective is not granted, then the analysis cannot even begin. As the dogma has it, there cannot be a theory-neutral observation (or analysis).

III. The Tree of Philosophy

After the *cogito*, these from *Principles of Philosophy* are perhaps the most famous lines in Descartes: "Thus the whole of philosophy is like a tree. The roots are metaphysics, the trunk is physics, and the branches emerging from the trunk are all the other sciences, which may be reduced to three principal ones, namely medicine, mechanics and morals."[16] (CSM I, 186; AT IXB, 14) Descartes' tree of philosophy would look like Figure 1.1. The arrows in the diagram indicate notions such as *dependence*, *reduction*, *support*, *grounded in*, *resting secure in*, and other such loosely similar ideas, since Descartes did not have a precise conceptual notion of how the sciences at the top of the tree were related to those at the lower levels, or to the one at the bottom. "I will also add," said Descartes to Clerselier, in a letter written in June or July 1646, "that one should not require the first principle to be such that all other propositions can be reduced to it and proved by it. It is enough if it is useful for the discovery of many, and if there is no other proposition on which it *depends*, and none which is easier to discover." (CSMK, 290; AT IV, 444–445; my emphasis) To cover this multitude of concepts, I shall use the colorless term *dependent on*. When he was younger, Descartes had thought that all of the sciences, if their links or derivations were properly established, could be held in the mind's eye quite easily. "The sciences are at present masked, but if the masks were taken off, they would be revealed in all their beauty. If we could see how the sciences are linked together, we would find them no harder to retain in our minds than the series of numbers." (CSM I, 3; AT X, 215) Descartes' tree of philosophy could aid in that cause.

[16] The tree analogy is also presented in Francis Bacon's *Advancement of Learning*, II, v. 1, v. 3; *De Augumentis*, III, i–ii, quoted in Edwin A. Abbott's *Francis Bacon: An Account of His Life and Works*, 354–355. On November 10, 1619, Descartes had some remarkable dreams, in one of which he dreamed of a dictionary representing all the sciences gathered together; see V, 54–59.

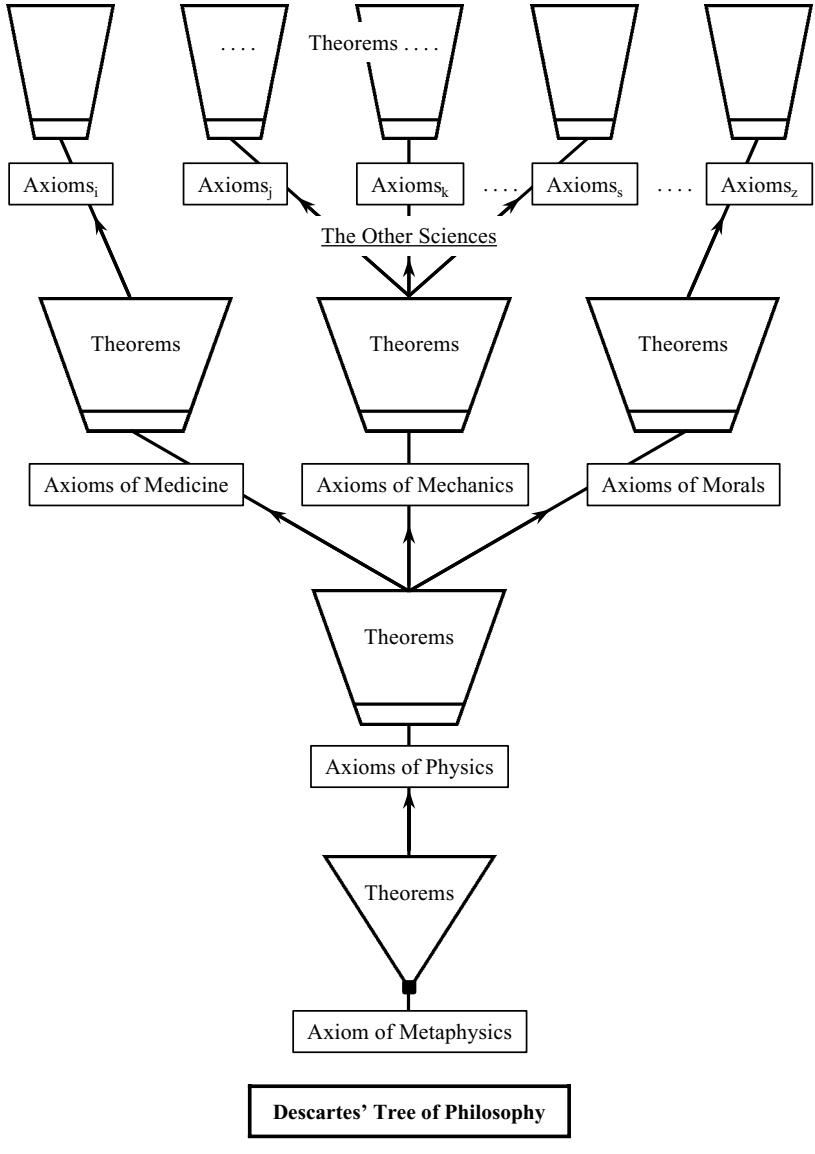

FIGURE 1.1.

To illustrate: Suppose pathology to be one of the sciences defined, say, by axioms$_i$; this field of science can be reasonably regarded as dependent on the science of medicine. Given a theory of how the heart functions – for example, William Harvey's theory of the

heart and the circulation of the blood, a theory that Descartes rightly considered important enough to argue with – Descartes approached it in a Hobbes-like manner, but came away less satisfied than Hobbes was with Euclidean geometry.[17] He disagreed with Harvey's explanation, and showed how Harvey's empirical results could eventually be shown to be more satisfactorily dependent on the axioms of medicine, and not on Harvey's outmoded Aristotelianism. Furthermore, the axioms of medicine could be made to be firmly dependent on the theorems, and hence on the axioms, of physics. Finally, the axioms of physics could be made dependent on the theorems and the axiom of metaphysics. Thus, one of the several branches at the top of the tree – pathology – can be shown to be dependent on one of the three principal branches – medicine – below; this latter branch is supported by the trunk – physics – which, in turn, is nourished by the roots – metaphysics. Consequently, pathology is dependent on metaphysics. In a similar vein, everything can be seen to be dependent on metaphysics. The notion of *dependence* allows for knowledge to be increased by experiment; it is not the case that once the metaphysical axiom is discovered the rest of the knowledge can be secured by executing merely logical deduction. Thus, Descartes was in earnest when, at the end of the *Discourse on the Method*, "he had called for the public's help in carrying out all the experiments necessary to 'justify my arguments.' 'It could take several centuries before we have thus deduced from these principles all the truths that can be deduced from them.'" (R, 177–178; AT IX, 2:20)

Now, if metaphysics was the most fundamental discipline, were physics and mathematics dependent on it? Likewise, was morals, for example, dependent on physics and hence in turn on metaphysics? Or were they – physics, mathematics, and morals – just vaguely supported by metaphysics, not dependent on it? In the *Principles of*

[17] At forty, yet innocent of mathematics, Thomas Hobbes accepted a nobleman's invitation to travel on the continent and tutor his son. One day, he found a copy of Euclid lying open in the library of his distinguished employer at the page boasting of Pythagoras' theorem. His friend, John Aubrey: "He read the proposition. 'By God,' sayd he, 'this is impossible.' So he reads the demonstration of it, which referred him back to such a proposition; which proposition he read. That referred him back to another, which he also read.*Et sic deniceps* [and so one after another] that at last he was demonstratively convinced of that trueth. This made him in love with geometry." (Quoted in William Kneale and Martha Kneale, *The Development of Logic*, 311.)

Philosophy, Descartes wrote, "medicine and mechanics, and all the other arts . . . can be fully developed with the help of physics" (CSM I, 289; AT VIIIA, 327). What is the nature of this *help*? This leaves unclear, too, whether other principles, besides those of physics, are also required for developing all the other arts. Is physics just necessary for these arts, or is it both necessary and sufficient?

There are, of course, various sciences at the top of the tree, such as (to mention only the ones that Descartes himself acknowledged) transmutation of metals, chemistry, anatomy, virtues of plants, astronomy, botany, meteorology, geography, zoology, psychology, music, and optics. The status of the axioms must be properly understood. The axioms of the other sciences – say, the axioms_j of meteorology – are fundamental relative to their own science, but not fundamental in the whole scheme of knowledge. They are in some ways dependent on at least one of the three sciences below them: For example, the axioms_i of meteorology are dependent on the axioms of mechanics. Again, the axioms of the three sciences of medicine, mechanics, and morals are fundamental relative to their own respective fields, but not in the entire scheme of knowledge. For example, the axioms of mechanics are dependent on the axioms of physics. The latter axioms, in turn, are dependent on the axiom of metaphysics. The axiom of metaphysics is absolute not only within metaphysics, but absolute in the total scheme of knowledge, since ultimately that axiom is not supported by, dependent, derived, or based on anything other than itself.

The relation between the sciences at the top of the tree and those at the bottom is not precisely clear. For example, are the sciences at the top dependent on one of the three principal sciences below (which in turn are dependent on physics and metaphysics)? Or would two or more principal sciences be required? It is understandable if meteorology is dependent on mechanics; which in turn is dependent on physics, and so on. But it is not intuitively plausible to think that pathology would be solely dependent on mechanics; at the very least it may be dependent on mechanics and medicine, which in turn are dependent on physics, and so on. Thus, in *Description of the Human Body*, Descartes says that "it is so important to know the true cause of the heart's movement that without such knowledge it is impossible to know anything which relates to the theory of medicine" (CSM I, 319; AT XI, 245). But

the problem of the motion of the heart belongs to physiology, and so clearly physiology, not one of the three branches below, may not be dependent on just medicine, but may be dependent on both mechanics and medicine. Descartes also left open the question of just how independent the three principal sciences were. Indeed, was it essential that they be independent, if conjointly they could serve as the axioms for everything above them?

The various axioms of various disciplines, such as medicine, mechanics, and morals, are in some deeper sense not quite fundamental yet. For as Descartes will show us, they too can be doubted. If so, they must take their nourishment from the roots, namely, metaphysics. But metaphysics itself consists of complex truths about complex disciplines of complex objects, such as the physical world, time, space, numbers, matter, mind, and God. What, if anything, will provide us with the starting point that Descartes is looking for? Will the nature of this philosophical axiom be akin to the other axioms higher up on the tree of knowledge? Or will it be different?

We have arrived at the primary task of philosophy, namely: Is there such a single metaphysical axiom – an axiom that, like the axioms of geometry, cannot be questioned, cannot be argued for, cannot be proved by anything else? An axiom that would support all the axioms and theorems of all the other disciplines, including those of metaphysics? Or are there, after all, *several* metaphysical axioms? If there is just one axiom, then it too would only have to be understood in order to be perceived as clear, distinct, and indubitable, and in such a manner that its truth, says Descartes, would strike home more strongly than the truth of a mathematical axiom when the latter is understood.[18] Descartes' tree of philosophy makes it amply clear that such an axiom would be the foundation of all human knowledge: everything resting on it, *it* resting on nothing else. Were such an axiom to be found, it would be as though a fulcrum had been discovered from which to move the universe.

If we combine the rules of analysis, the rules of synthesis, and the rules of hypothesis making and hypothesis evaluation, we get

[18] Such a claim is repeatedly made: See, for example, CSMK, 23, AT I, 144; CSMK, 29, AT I, 182; CSMK, 53, AT I, 350; and CSM II, 416, AT X, 522.