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ESSAYS ON DESCARTES' *Meditations*

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UNIVERSITY OF CALIFORNIA PRESS

BERKELEY LOS ANGELES LONDON

1986

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The Senses and the Fleshless Eye: The *Meditations* as Cognitive Exercises

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... so I do not see how it would make sense to say God is not deceitful, if in fact they [sensory ideas] proceed from elsewhere, not from corporeal objects. Therefore corporeal objects must exist. It may be that not all bodies are such as my senses apprehend them, for this sensory apprehension is in many ways obscure and confused; but at any rate their nature must comprise whatever I clearly and distinctly understand—that is, whatever, generally considered, falls within the subject-matter of pure mathematics. There remain some highly doubtful and uncertain points; either mere details, like the sun's having a certain size or shape, or things unclearly understood, like light, sound, pain, and so on. But since God is not deceitful, there cannot possibly occur any error in my opinions but I can correct by means of some faculty God has given me to that end; and this gives me some hope of arriving at the truth even on such matters. (AG, 116)¹

This passage from the Sixth Meditation marks an ending and a beginning. It brings to fruition that portion of the metaphysical project of Descartes' *Meditations on First Philosophy* which pertains to the material world. The meditator regains knowledge of corporeal objects, knowledge of which had been undermined by the doubts of the First Meditation. The meditator now has a clear conception of both the existence and the essence of material things—their essence being extension, "the subject-matter of pure mathematics." As the passage implies, however, the completion of this metaphysical project allows the beginning of two further projects: (1) that of developing a precise theory of the senses, partially in order to give an account of "things unclearly

understood," and (2) that of filling in "details" about the structure of nature, which constitutes the project of "natural philosophy" (or natural science).

This passage does not reveal that the world regained is different from the one that was earlier lost. Consonant with Descartes' revolutionary aims, the "clean sweep" achieved by the doubt at the beginning of the *Meditations* has cleared the ground of previous cognitive constructions—especially the dominant Scholastic Aristotelianism of his time—to make room for Descartes' new conception of the mind and the corporeal world. The two projects mentioned above constitute new construction, to replace a discarded theory of the senses and conception of nature.

Descartes' doctrine of the senses lay at the heart of his revolution, for it was by shifting the status of the senses as sources of knowledge that Descartes effected his attack on Scholastic Aristotelianism. He did not confront the old metaphysics directly, but indirectly by undercutting and replacing the model of the knower woven into Aristotelian philosophy. At the core of the Aristotelian conception of the knower lay a sense-based epistemology, which was distilled into the slogan, "Nothing is in the intellect that was not first in the senses." As elaborated by Thomas Aquinas and subsequent Aristotelians, this implied that all knowledge, including knowledge of God, the soul, and the truths of mathematics, is attained by the intellectual abstraction of universals from sensory particulars.² In the course of the *Meditations*, Descartes reaches the opposite conclusion, that the things known first and known best are not known by or through the senses, but through the independent operation of the intellect. Descartes' replacement dictum might be phrased, "Nothing is accepted from the senses that was not first in the intellect." In the reformed hierarchy of knowing faculties the intellect stands autonomous and supreme. The radical upshot is that the metaphysical picture provided by the intellect will guide the formation of a new theory of the senses and the construction of a new science of nature (with the aid of sensory observation and experiment). Just as the intellect rules the senses, metaphysics frames the theory of sense perception and of all physics proper.

This construal of Descartes' strategy in the *Meditations* brings into prominence an aspect of the use of skeptical doubt in that work which has previously been obscured. Usually, Descartes' "method of doubt" is placed in the context of two intellectual currents against which Descartes was reacting: skepticism and Scholastic Aristotelianism. The doubt of the First Meditation serves as a way to undermine (Aristotelian) orthodoxy by overturning the applecart.³ Further, the well-worn

arguments of the skeptics are raised in order to show that they can be refuted (in subsequent *Meditations*), and to underscore the high degree of certainty of Descartes' own doctrines, which will be established in the face of stringent skepticism.⁴ But these functions of the doubt do not reveal its special use in the *Meditations*, which derives from a peculiar characteristic of that work: that it is cast in the form of meditations. As Descartes maintained in response to Hobbes' complaint that the First Meditation vends stale goods, an essential function of the doubt is "to accustom the reader's mind to consider intelligible objects and distinguish them from corporeal things—and to this end such doubts are indispensable" (HR II, 61). The doubt itself does not "accustom" the mind to consider intelligible objects, but it provides a means for suspending judgment about corporeal things and drives one to a last refuge of certainty in the direct apprehension of one's own thought. It serves as a kind of exercise for the mind. It is, I shall argue, indispensable in this regard because it provides the means for freeing one's attention from sensory ideas in order to attend to an independent source of knowledge: the pure deliverances of the intellect. It thus serves a function in Descartes' *Meditations* similar to that of doubt and other "purgings" of the senses in the tradition of spiritual meditation stemming from St. Augustine.

According to the reading I shall offer, Descartes' use of the meditative mode of writing was not a mere rhetorical device to win an audience accustomed to the spiritual retreat. His choice of the literary form of the spiritual exercise was consonant with, if not determined by, his theory of the mind and of the basis of human knowledge. Since Descartes' conception of knowledge implied the priority of the intellect over the senses, and indeed the priority of an intellect operating independently of the senses, and since, in Descartes' view, the untutored individual was likely to be nearly wholly immersed in the senses, a procedure was needed for freeing the intellect from sensory domination so that the truth might be seen. Hence, the cognitive exercises of the *Meditations*.

This reading entails a distinctive attitude toward the role of argument in the *Meditations*. Although works of religious meditation may make use of argument, their purpose is not to present a continuous argument that compels by force of logic; they serve as guidebooks to prepare the soul for illumination from above or within. Similarly, Descartes' *Meditations* are not so much a continuous argument as a set of instructions for uncovering the truths that lie immanent in the intellect. Not that there are *no* arguments in the *Meditations*; the language of argument is interspersed throughout the work. But some

conclusions seem to arrive out of nowhere, without discursive argument—such as the conclusion that the essence of matter is extension, or that one can discover in one's thought the idea of an infinite, benevolent being. I want to suggest that Descartes' work is constructed in such a way that the force of such conclusions depends on the ability of the meditative exercises to evoke in the reader certain experiences that bring their own content and carry their own conviction. The *Meditations* must evoke the appropriate cognitive experiences in the meditator.

I

My argument depends upon establishing with some exactness the relationship between Descartes' *Meditations* and the types of spiritual exercises available to him in the Roman Catholic tradition. Although virtually all devotional literature in the early seventeenth century shows the influence of Augustine, a division can be made into two groups, which I will call Ignatian and Augustinian. This division reflects differing accounts of the cognitive basis of meditative experience implicit or explicit in various writers. Ignatius assumes an Aristotelian account of cognition; writers in the Augustinian tradition, such as Eustace of St. Paul, reveal the influence of Augustine's neo-Platonic bent.⁵ Descartes would have been familiar with both traditions, the Ignatian from his Jesuit school days, the Augustinian from his contact with the Parisian oratory during the 1620s.⁶

By the early seventeenth century a generalized structure had insinuated itself into meditative writing, the essentials of which were expressed in Ignatius's *Exercises* (1548) and the attendant *Directory* (1591), and had been implicit in Augustine's *Confessions*. This generalized structure may be summarized according to two trinitarian doctrines: the three powers and the three ways. The "three powers" refers to three powers of the soul—memory, understanding, and will—and enjoins that meditation should engage each of these.⁷ The memory, including imagination, is used to contemplate various subject matters, such as original sin, hell, or the passion of Christ. Where possible, the meditative text will aid in calling forth vivid images of the fires of perdition or the suffering of the Savior. The understanding then draws implications from the object lesson (e.g., hell should be avoided), with the end of raising affections in the will (e.g., the desire to follow steadfastly the example of Christ) and strengthening its resolve (e.g., to avoid the evil of sin). The guidance of the will is the ultimate objective of meditation.

The second doctrine parallels the first by introducing three "ways" or stages through which the meditator should pass. In the first of these, the purgative, the body is mortified, so that one may turn away from sin, the senses, and sensuality. This prepares the soul for the illuminative way, in which one endeavors to achieve a positive exercise of the Christian virtues by becoming aware of the moral power of the soul through the example of Christ or by other divine illumination. Souls that have achieved illumination may then enter the unitive way, seeking union with God through the joining of their own wills with the divine will.⁸

Parallels between these formal doctrines and the structure of Descartes' *Meditations* are striking. The three ways, leading away from the world to God, are paralleled by Descartes' meditator, who "purges" the senses and even the perception of simple mathematical truths (First Meditation), is illuminated by the *cogito* and by the knowledge of God (Second and Third Meditations), and seeks to direct his will in the manner intended by God (Fourth Meditation). Moreover, one sees in various meditations the use of the three faculties—memory, understanding (or intellect), and will. Hence, at various places in the First Meditation the meditator recalls (a) that what he has accepted as true to this time was known by means of the senses and that the senses have deceived him, (b) instances of being deceived by dreams, and (c) "the old opinion that there is a God who can do everything." From these remembered notions together with other considerations the understanding draws various conclusions about the deceptiveness of the senses and the possibility of delusion even about mathematics. The Meditation ends with the meditator focusing on the grounds for doubt, and even positing the evil deceiver, as means for strengthening his will so that he can withhold assent from his old, possibly erring, opinions (see also the "resolutions" of the will at the end of the Second and Fourth Meditations).

A second type of parallel is not revealed by the formalized doctrines just discussed. Meditations carried their force in at least two ways. First, they brought forward "considerations" that could appeal to the understanding; these were cast in the form of discursive arguments.⁹ Second, they called for the exemplification of various matters directly before the mind, as in a direct vision of God, or as Christian virtue is exemplified in a contemplation of the life of Christ. Here one was not supposed to be persuaded by argument, but rather to become immediately acquainted with God or to gain practice in directing the will toward virtue (through following the example of Christ).¹⁰ Especially in the Augustinian tradition, exemplification involved illumination of the intellect and will by divine light, yielding direct apprehen-

sion of eternal truth (or of the supreme good) akin to Platonic contemplation of the forms.¹¹

Similarly, Descartes' *Meditations* contain both argument and exemplification. Sometimes argument is used in the service of exemplification, as when the skeptical arguments of the First Meditation are used, not to achieve a positive conclusion, but to suspend judgment in order to uncover something that is immediately and indubitably known. Much of the rest of the *Meditations*, which comes out looking rather odd when treated as argument, is quite naturally seen as exemplification.¹² Thus, the briefly sketched argument to the conclusion "that the proposition 'I am,' 'I exist,' whenever I utter it or conceive it in my mind, is necessarily true" (AG, 67) is ultimately presented as resting on the direct apprehension of the meditator's own thinking (HR II, 207). This direct apprehension requires that the mind "must be abstracted from the senses," an achievement that is prepared for by the doubt of the First Meditation (cf. HR II, 60–61), and realized in the Second Meditation's meditation on the human mind (cf. HR II, 32). The conclusion of *sum* from *cogito* is regarded as established not by argument, but by "recognising it as something self-evident, in a simple mental intuition" (AG, 299; cf. AG, 300–301), and is recalled as such at the beginning of the Third Meditation. This intuition is not attained by the *cogito* argument itself, but by the succeeding investigation of "this 'I' that necessarily exists" (AG, 67–71).

Exemplification in intuition is at work at other key points in the text. Thus, at various places before Descartes' meditator draws the mind-body distinction, he gives the reader practice at conceiving the mind as thinking and nonextended (Second Meditation, AG, 68–76; Third Meditation, AG, 84; Fourth Meditation, AG, 92). When he asserts at the opening of the Fifth Meditation that extension is what is clearly known in body, he neither gives an argument there nor relies on a previous one; however, he can rely on previous instances of exercising the mind in the perception of particular bodies as extended, as in the thought experiment with the piece of wax in the Second Meditation (AG, 72–73), which is recalled and generalized in the Third Meditation (AG, 83). Hence, exemplification provides both the immediate apprehension that extension constitutes the essence of material things, and the apprehension that thought is completely distinct from extension, thereby providing the crucial premises for the argument to the distinctness of mind and body (AG, 114–115). Similarly, the immediate apprehension of the idea of God serves as a basis for the argument to God's existence (Third and Fifth Meditations). And so exemplification in intuition importantly underlies the

chief metaphysical conclusions of the *Meditations*, regarding mind, matter, and God.

The appeal to exemplification and illumination reveals the extent to which meditative literature depends on the evocation of experiences in the reader. By carefully arranged settings and preparatory exercises, the reader is brought into the proper state to receive the light of grace (in spiritual meditations) or to perceive the unvarnished truth by the light of nature (in Descartes' cognitive exercises). In consonance with the experiential thrust of the practice of meditation, the meditative text itself often contained an explicit theory of cognitive function—as in the doctrine of the three powers—which explained the role of the various cognitive faculties in the reception of illumination. Descartes' *Meditations* were no exception.

In his account of the cognitive base of meditation, Descartes radically broke with the mainstream Ignatian tradition and turned to the tradition stemming from Augustine.¹³ The mainstream reflected in a broad way the teaching of Thomas Aquinas, and laid heavy stress on the use of the faculties of memory and imagination. Aquinas himself, with his Aristotelian, sense-based epistemology, contended that (revelation aside) God can be known only by means of our sensory contact with His creation. Correspondingly, Aquinas stressed the role of sensible objects in meditation, and especially recommended applying the imagination to the passion of Christ.¹⁴ In the tradition of formal meditation, this emphasis on imagination was heightened—Ignatius invites one to see, feel, hear, taste, and smell the horrors of hell¹⁵—and the role of the understanding was limited to drawing conclusions from imagined material. In this tradition, the meditator turns away from mundane sensory and sensual distractions for a period, the better to focus the mind on spiritually uplifting sensory materials constructed by the imagination.

Augustine, in contrast, searches memory (and imagination) through and through, and does not find God. God cannot be found in memory, because He is not known by way of image, as are corporeal things.¹⁶ Indeed, in the *Confessions* Augustine returns again and again to the theme that it was his attempt to conceive God as extended in space, and therefore as able to be portrayed in the imagination, that had prevented him from knowing the deity.¹⁷ In order to see God, he needed "to brush away the swarm of unclean flies that swarmed around the eyes of my mind."¹⁸ The clearing of an intellectual vista to the deity was achieved by sweeping away his earlier (Manichean) opinions through the clever ploy of adopting a skeptical doubt.¹⁹ The skeptical doubt then dissolves in the face of a direct vision of God,

which itself was achieved through contemplating the immateriality of his own mind.

And thus by degrees I was led upward from bodies to the soul which perceives them by means of the bodily senses, and from there on to the soul's inward faculty, to which the bodily senses report outward things—and this belongs even to the capacities of the beasts—and thence on up to the reasoning power, to whose judgment is referred the experience received from the bodily sense. And when this power of reason within me also found that it was changeable, it raised itself up to its own intellectual principle, and withdrew its thoughts from experience, abstracting itself from the contradictory throng of fantasms in order to seek for that light in which it was bathed. Then, without any doubting, it cried out that the unchangeable was better than the changeable. From this it follows that the mind somehow knew the unchangeable, for unless it had known it in some fashion, it could have had no sure ground for preferring it to the changeable. And thus with the flash of a trembling glance, it arrived at *that which is*. And I saw thy invisibility understood by means of the things that are made.²⁰

By turning away from the senses and discovering his own intellect as an invisible, immaterial, and yet mutable power, he was led to see with the fleshless eye of the mind the invisible, immaterial, immutable deity. For one who wished to follow Augustine in his process of contemplation, the doubt and subsequent turning away from the senses ("the contradictory throng of fantasms") would not be undertaken in order to provide the proper frame of mind for examining new sensory and imaginal materials; rather, the senses and imagination would be neglected because they cannot possibly afford a knowledge of God or the soul. Only the intellect turning inward can know the immaterial.

Here then is a model for the *Meditations* of Descartes, in which the meditator uses skepticism and contemplation of his own thought to withdraw the mind from the senses, and then, having fought off the "images of sensible objects" that blind the "mind's eye" (AG, 87), achieves contemplation of God ("the beauty of this immeasurable light" [AG, 91]). Consistent with the Augustinian character of the *Meditations*, Descartes repeatedly stresses the importance of the skeptical doubt, and of the *cogito*, as means for bringing the appropriate cognitive resources to bear in his search for first truths. The clear and distinct perception of his own existence yields a "great illumination of the understanding," which prompts a "great inclination of the will" to judge what is so understood to be true, thereby nullifying the force of skeptical doubt and hesitation (AG, 97). A will momentarily unfettered by prejudice and habit can seek truth in an autonomous faculty

of understanding. Descartes reviews the progress of the first three *Meditations* in just these terms:

In the last few days I have accustomed myself to withdraw my mind from the senses; I have been careful to observe how little truth there is in our perceptions of corporeal objects; how much more is known about the human mind, and how much more again about God. I thus have now no difficulty at all in turning my thoughts from imaginable objects to objects that are purely intelligible and wholly separate from matter. (AG, 92)

As he remarks in the *Objections and Replies*, he has chosen the meditative mode of writing because of the great difficulty in arriving at a clear and distinct perception of the primary notions of metaphysics: "For, though in their own nature they are as intelligible as, or even more intelligible than those the geometricians study, yet being contradicted by many preconceptions of our senses to which we have since our earliest years been accustomed, they cannot be perfectly apprehended except by those who give strenuous attention and study to them, and withdraw their minds as far as possible from matters corporeal."²¹ Descartes repeatedly emphasizes the need to spend days and weeks in the study of each *Meditation*, not merely because the subject matter is difficult and full attention is required, but because he is asking the reader literally to think in a new way.²² Descartes' meditator does not forsake things sensory merely to avoid interruption, but to discover a new manner and object of thought. The meditative mode of writing is chosen because it invites one to turn inward, and that is where Descartes believed his metaphysical first principles were to be discovered, lying immanent in the intellectual faculty of the meditator.

The Augustinian character of Descartes' *Meditations* can be consolidated by reflection on its differing uses of the faculty of memory. We have seen that meditations in the tradition of Aquinas and Ignatius employ the memory as a source of materials for contemplation. Augustine could not find God in memory, but at first could remember only his mistaken search for God among corporeal things; later he uses memory as a repository for knowledge of the deity achieved through illumination.²³ Descartes uses memory as a source of materials for contemplation primarily in the First *Meditation*, where he recalls various "old opinions"—such as that the senses are the chief source of knowledge—as well as recalling various reasons for doubting these old opinions—such as the possibility of a deceiving God (since this idea is *recalled*, not perceived directly by the intellect, a deceiving God is a possibility). Prior to the illumination of the *cogito* and the actual

contemplation of God, the meditator is reasoning within the domain of common experience and belief; memory is a repository of commonly accepted errors. As the meditator initiates his search for an Archimedean point, he forsakes memory (and thereby tradition, except as a source of old, erroneous opinions),²⁴ and searches his own immediate experience. Memory then becomes a means for retaining the knowledge gained through the *inspectio* of the *cogito* and the idea of God (AG, 75, 100, 107).

Despite the numerous parallels between Descartes' work and Christian meditation, a wide gulf separates the two. In each case the purpose of meditation is constructive: the meditator is to be transformed, through achieving a new understanding and through the reformation of the will. But the types of understanding and reformation are distinct. The Christian seeks new understanding and acquaintance with God in order to guide the will in attaining Christian virtue. Descartes' meditator achieves knowledge of God, but does so in the service of gaining a better acquaintance with his own cognitive faculties, ultimately in order to recognize the strengths and limitations of human understanding and to curb the source of its errors in the impetuous will. The Christian returns from meditation with a firmer resolve to avoid sin (or moral error) and to embrace virtue. Descartes' meditator returns from contemplation with a firmer resolve to avoid epistemic error and to seek the truth, in the hope of establishing "some secure and lasting result in science" (AG, 61).²⁵

When Descartes was in school the Jesuit practice was to hold an extended spiritual retreat once each year. The Augustinians of the Oratory also were fond of the retreat. Descartes, however, counseled a *cognitive* retreat only once in a lifetime. He wrote to Elizabeth in June of 1643:

I think it is very necessary to have understood, once in a lifetime, the principles of metaphysics, since it is by them that we come to the knowledge of God and of our soul. But I think also that it would be very harmful to occupy one's intellect frequently in meditating upon them, since this would impede it from devoting itself to the functions of the imagination and senses. I think the best thing is to content oneself with keeping in one's memory and one's belief the conclusions which one has once drawn from them, and then employ the rest of one's study time to thoughts in which the intellect cooperates with the imagination and the senses. (K, 143)

Descartes seems to be saying that once one has, through metaphysical meditation, achieved a knowledge of the principles of metaphysics, one should then return to the affairs of the world (just as Augustine

used the memory of God as a source of strength for confronting worldly affairs). Descartes' meditator returns to the world not only with a fresh knowledge of God and the soul but also with a fresh understanding of the nature of corporeal things. With the metaphysical knowledge that extension is the essence of matter firmly implanted in memory, the meditator is prepared to employ the senses and imagination in the investigation of nature.²⁶

A final, fundamental point of comparison underscores the autonomy of the meditator. Mystical and meditative writings stress the experience of the meditator himself. Although spiritual exercises may be guided by a director, the individual seeks his own experience of God. The instructions of the director and the guidance of the text itself become secondary to the individual's personal illumination. Yet this illumination is not held out as something the individual can achieve on his own. No human aid may be required, but meditators from Augustine to Eustace of St. Paul recognized the dependence of the exercitant on the assistance of faith granted through divine grace. In Eustace's *Exercices spirituels* (1630), the meditator purges not only the senses and imagination but the intellect as well, thereby abandoning the human faculty of judgment in the hope of illumination from on high.²⁷ The success of meditation in achieving union with God ultimately depends on the inscrutable dispensation of grace.

For his pursuit of permanent results in science, Descartes makes the autonomy of the meditator absolute. This autonomy emerges parenthetically in the synopsis of the *Meditations*: "I do not intend to speak of matters pertaining to Faith or the conduct of life, but only of those which concern speculative truths, and which may be known by the sole aid of the light of nature" (HR I, 142). Descartes' meditator never forsakes his own faculty of judgment, or "natural light"; early in the Third Meditation, he explicitly puts its deliverances absolutely beyond doubt.²⁸ Moreover, the autonomy of the meditator is not diminished by his conclusion that the trustworthiness of the natural light derives from its source in God (and therefore that a knowledge of God is necessary to avoid skepticism and achieve lasting science), for that conclusion itself is derived under the aegis of the natural light.²⁹ Furthermore, this divine gift is dispensed equally to all, so no one can claim special illumination regarding matters that fall within the purview of human reason (as opposed to matters of faith). As befits one whose aim was to secure an independent stance for natural science, Descartes never makes the search after truth dependent upon the grace of God.³⁰ The investigation of nature may proceed independently of revealed doctrine.

II

Descartes' elaboration of a meditative mode of arriving at metaphysical first truths reflected his doctrine that the intellect constitutes a source of knowledge distinct from the senses. This non-Aristotelian doctrine of the autonomy of the intellect required a reconception of the relationship between the intellect and the senses. Although the senses no longer could play the exalted role of providing the only content for thought, Descartes' intellectualism did not allow him to ignore their role in cognition. Aristotelian philosophy had provided a unified account of sense perception and cognition; rejecting a part of it required replacing it all. Moreover, Descartes' abiding concern with natural science demanded an investigation into the possibility and reliability of sensory knowledge of natural things; for, no matter to what extent the intellect dominates the senses, the object of study in the investigation of nature—the corporeal, “visible” world—can be known in its details only by means of the senses.

In the *Meditations* proper Descartes gave only a very general picture of his theory of the senses. The senses are demoted from chief stewards of knowledge (AG, 111–114) to a more mundane, pragmatic function as navigational guides and arbiters of immediate bodily benefits and harms (AG, 117–119). By edict of First Philosophy, the deliverances of the senses are subject to evaluation and correction by the intellect. The meditator reaches the verdict that when sensory ideas are regarded as representations of material objects, the ideas of geometric (or “primary”) properties more clearly represent reality than do the ideas of sensory qualities (or “secondary qualities”) such as color, odor, and sound. Hence, the conclusion: “It may be that not all bodies are such as my senses apprehend them, for this sensory apprehension is in many ways obscure and confused; but at any rate their nature must comprise whatever I clearly and distinctly understand—that is, whatever, generally considered, falls within the subject-matter of pure mathematics” (AG, 116).

The authors of the sixth set of Objections challenged Descartes' doctrine that “the certitude of the understanding far exceeds that of the senses”; they asked whether instead the certitude of the understanding does not depend on “a good disposition of the senses,” and whether the correction of sensory errors does not result from a comparison among the reports of several senses, rather than from a direct judgment of the understanding (HR II, 238). In response to this challenge to the epistemic independence and priority of the intellect, Descartes provided a sketch of his physiology and psychology of

sense perception (a sketch that can be filled in from several of Descartes' other writings).³¹ This discussion of the physiological and psychological aspects of sense perception allowed Descartes to distinguish those portions of the sensory process to which certitude and error can properly be attributed from those portions that occur in accordance with nature and hence are not properly said to err or not to err. Descartes' response therefore provides a detailed guide to his conception of the line between the sensory and the intellectual aspects of sense perception.

Descartes distinguished three stages or “grades” of sense perception: (1) “the immediate affection of the bodily organ by external objects,” that is, the pattern of motion in the sense organ and brain caused by sensory stimulation; (2) “the immediate mental result, due to the mind's union with the corporeal organ affected”—Descartes lists the ideas of secondary qualities to exemplify this level, but in the case of vision also includes visual form; and (3) “those judgments which, on the occasion of motions occurring in the corporeal organ, we have from our earliest years been accustomed to pass about things external to us” (HR II, 251). These levels might be denoted “physiology,” “sensation,” and “perception”; the first comprises merely corporeal activity, the second implicates mind-body interaction, and the third involves the distinctively mental operation of judging.

The significance of Descartes' account of sense perception can best be grasped against the background of the standard Aristotelian account. The most radical contrast pertains to sensory physiology and the physics of light. For purposes of comparison, an Aristotelian account may be characterized in terms of the doctrines of form and matter and of the sensitive soul. In this connection, a thing's *form* may be understood as that which, in infusing a material substrate, makes a thing what it is. Any given substance has its essential form (as the form *man* informs a human, having the essence “rational animal”), as well as various accidental (nonessential) forms that determine its properties: a thing is red by virtue of instantiating the form of redness, and so on for roundness, coolness, and so forth. In the process of vision by which we perceive an object's redness or roundness, the forms of redness and roundness are transmitted through the optical medium (without the matter of the thing) to the sense organ and through the optic nerves to the seat of judgment (the Aristotelian “common sense”). The sentient soul receives and senses the very form of redness that exists in the red thing.³² Color as experienced by the percipient is a “species” of the color in the object. As Descartes put it, the Aristotelian conceives experienced color as “re-

sembling" color in objects (AC, 79, 194–196); color, like shape, is a "real property" of corporeal things.

In contrast, Descartes developed a wholly mechanistic account of light and visual physiology. The properties of objects, including both color and shape, are accounted for by appeal to geometrical properties alone (size, shape, position, and motion); the transmission of light from objects to the eye, and the attendant physiological processes in the optic nerve and brain are explained wholly in mechanical terms. Properties of objects such as size, shape, and motion are perspectively projected onto the retina by the rectilinear propagation and refraction of light (a motion in the aether) through various media; the retinal pattern is then transmitted to the surface of the pineal gland (the seat of mind-body interaction) via the fibers of the optic nerves, the motions of which cause a set of pores lining the interior of the brain to open, which allows "animal spirits" (very fine particles filtered out of the blood at the base of the pineal gland) to flow (rectilinearly) from the gland into the pores, all the while preserving the relative ordering of the parts of the retinal image. Diverse colors in objects are actually diverse surface textures (micro-variations in the shape of the surface), which impart spins of various velocities to particles of light, causing distinctive jiggings of the optic nerve fibers, leading to corresponding variations in the openings of the internal pores and hence in the character of the flow of animal spirits from the surface of the gland.³³ In sum, in the first stage of sensory activity—the pineal flow pattern—shape and size are represented in perspective projection, and color is represented by variations in the (amplitude of the?) flow of animal spirits. The processes involved are conceived in a purely mechanistic manner, contrary to the contemporary Aristotelian account, which attributes sentience and discriminative ability to the eye itself, owing to the presence there of the sensitive soul. For Descartes, there is nothing of the mental in the first grade of sense perception.

To the second stage of sensory activity belongs "the perception of the color or light" reflected from an object, resulting from the mind's being affected by the motions in the brain. This first properly mental component of sense perception comprises a sensation of a pattern of color and light corresponding to the pineal image.³⁴ This sensory image typically goes unnoticed, for it provides the immediate basis for the third grade of sense perception, which includes perception of the size, shape, and distance of seen objects. These properties are perceived as a result of rapid, habitual judgments based on the sensory image. Just as the first and second grades straddle the dividing line

between the corporeal and the mental, the second and third grades mark a distinction between what is properly sensory and what pertains to the intellect. For, as Descartes insisted, "that magnitude, distance and figure can be perceived by reasoning alone, which deduces them one from another, I have proved in the Dioptrics."³⁵ These judgments are so rapid that they go unnoticed, and we seem to apprehend directly the sizes and shapes of objects at a distance, unaware that our perception of those objects is mediated by the sensory image and the activity of the judging intellect.³⁶

Although the second and third grades of sensory activity constitute the boundary between the purely sensory and the properly intellectual, a comparison between the two does not underlie Descartes' doctrine of the greater certitude of the intellect over the senses. Descartes accepts the traditional Aristotelian teaching that the senses do not err, but that we err only insofar as we judge.³⁷ In his application, this implies that error (and hence certainty or uncertainty) does not reside in the first and second stages of sensory activity, but only in the third, which does not properly belong to the faculty of sense, but is "vulgarly" assigned there because the intellectual activity involved is habitual and unnoticed. Descartes accepts the common appellation of these unnoticed judgments as "sensory." His doctrine then draws a distinction between the third grade of "sense" and the greater certainty of yet a fourth level of considerations regarding sense perception, the mature judgments of the understanding. To use his example, the visual perception of a stick half-submerged in water as bent results from the habitual judgment of visual localization, which goes awry owing to the refractive properties of the interface between water and air. This faulty judgment is not corrected by simply trusting the implicit judgment of the tactual sense that the stick is straight, but rather by the mature judgment of the understanding that, under these conditions, touch is to be trusted over sight (HR II, 252–253).

If the notion that the intellect must certify sensory reports were all that Descartes' claim of the greater certitude of the intellect over the senses amounted to, it would be a rather unexceptional doctrine that surely would have been assented to by the more Aristotelian of the Aristotelians. But Descartes affirmed a deeper sense in which the mature judgments of the intellect frame the deliverances and correct the errors of the senses (or of the implicit judgments of ordinary sense perception). For Descartes maintained that, although the senses themselves do not deceive, they provide material for error in the obscure sensations of color, sound, heat, and so forth. These sensations are

obscure in that they do not in themselves afford a knowledge of what color, sound, heat, and so forth, *are* (when considered as properties of objects): that is, they do not reveal that these properties are dispositions of the size, shape, and motion of the minute corpuscles of objects (and their surrounding media) to produce sensations in us.³⁸ Nonetheless, owing to the prejudices of childhood, we habitually judge that these sensations do afford us an immediate knowledge of the properties of objects and, in fact, that the external objects implant in us through the senses a "likeness" or "picture" of themselves or, indeed, that sensations "resemble" the properties of objects (AG, 79–80); for "since I had no conception of these objects from any other source than the ideas themselves, it could not but occur to me that they were like the ideas" (AG, 112). It is this habitual childhood (and Aristotelian) prejudice that must be corrected by the mature intellect.

Descartes' "no resemblance" doctrine of sensory qualities such as color constituted a second major break with the Aristotelian account of the senses, or rather constituted a second aspect of his departure from that orthodoxy. Descartes' account introduces a sharp division between color as a property of objects, together with its effect on the medium and the nervous system, and the sensation of color experienced by the mind. The mental experience of phenomenal color (resulting from pineal agitation) falls under the mystery of mind-body interaction (AG, 116–117); its physical and physiological causes may be investigated through the clear and distinct conceptions of mechanistic physics.

Descartes' new doctrine raised a new problem of explanation and justification—namely, to show why color in objects should be thought of geometrically and mechanistically rather than as a real or primary property. In the sentence quoted above, Descartes adumbrates that this justification must come from a source other than the sensory ideas themselves. What are the candidate sources? One might suppose that mechanistic physics itself does all the work that need be done here, by providing a clear and compelling account of the operation of the senses. But notice that this account appeals to microproperties of objects, sensory media, and the nervous system, which are at best inferred. Why should one accept a mechanistic rather than an Aristotelian account of the senses in the first place? This poses a general question about the sources of knowledge that frame both particular sensory judgments and the theory of the senses itself, and forces us to come to grips with the status of the intellect as an independent source of knowledge.

III

According to the reading I shall give, Descartes' new geometrico-mechanical theory of the senses received its justification as part of the larger project to "geometrize" nature as a whole. Descartes' doctrine that all sensory qualities are reducible to the (macro- or micro-) geometrical properties of objects was simply part and parcel of his doctrine that matter possesses only geometrical (including kinematic) properties *tout court*. Both were justified by the metaphysics of the *Meditations*.

In the earlier *Rules for the Direction of the Mind* Descartes had derived his account of human knowledge from reflection on his conception of the best natural-scientific account of the senses and imagination; he had worked from an account of the operation of these organs to a general conception of nature.³⁹ Having aborted this project and confronted skeptical challenges, Descartes reversed the direction of conceptualization and justification in his mature period (after 1629).⁴⁰ He now would work not from an account of the sensory process, but from the metaphysical conception of pure intellect. Consonant with the meditative genre, in the *Meditations* Descartes cast his account of the relation between sensory knowledge and metaphysics in terms of cognitive faculties. In considering the usefulness of the senses, the meditator concludes that he should not "draw any conclusion from sense perception as regards external objects without a previous examination by the understanding; for knowledge of the truth about them seems to belong to the mind alone, not to the composite whole" (AG, 118); it is an error to use the senses "as if they were sure criteria for a direct judgment as to the essence of external bodies" (AG, 119). The admonition of a "previous examination" by the intellect is not practical advice to think before looking; it suggests deciding by the mind alone (without looking) what properties one should expect to find in external objects. Metaphysical knowledge of the corporeal world is prior to sensory knowledge, because it is obtained by the intellect operating independently of the senses. In Descartes' mature thought, metaphysics frames physics, including the theory of sense perception, in that it allegedly provides, independently of sensory experience and of any theory of the corporeal world or the operation of the sense organs, direct insight into the fundamental nature of matter. This insight then delimits and guides the construction of an account of sensory knowledge.

The key metaphysical insight behind Descartes' geometrization of

The key metaphysical insight behind Descartes' geometrization of nature is the doctrine that the essence of matter is extension ("the subject-matter of pure mathematics" [AG, 108, 116]). In the Fifth Meditation, where he introduces the notion that pure extension constitutes the essence of material things, the meditator contends:

Before enquiring whether any such objects exist outside me, I must consider the ideas of them, precisely as occurring in my consciousness, and see which of them are distinct and which confused. I distinctly imagine, the so-called continuous quantity of the philosophers; that is to say, the extension of quantity, or rather the quantified object, in length, breadth, and depth. I can enumerate different parts of it; to these parts I can assign at will size, shape, position, and local motion; and to these motions I can assign any durations I choose. (AG, 101)

The distinct ideas of bodies comprise extension and its geometrical modifications (together with the extrinsic denominations of arithmetic enumeration and temporal duration).⁴¹ The meditator later concludes from the notion that only extension is clearly known in body that it constitutes the essence of body. Of interest here is the fact that in establishing the distinctness with which extension is known, the meditator says that one can distinctly *imagine* quantity, which could imply that metaphysical knowledge of body ultimately depends on the faculty of imagination. Such an implication would conform to the teaching of the *Rules*, according to which the certainty of our knowledge of extension is certified by the fact that in employing the imagination to contemplate an extended area, we contemplate an actual exemplar of extension in the "really material body" of the imaginal faculty of the brain (Rule 14).⁴² This justificatory strategy makes sense in the *Rules*, since Descartes could refer back to the earlier account (Rule 12) of the operation of the senses and imagination in terms of modifications of figure alone (i.e., figural modifications of an extended bodily organ). Such a strategy is not available in the *Meditations*, since in the Fifth Meditation the existence of the body, and hence of the corporeal faculty of imagination, is still in doubt. Imaginings are available as a part of the meditator's experience, and any use of imagination could appeal only to such experience, independently of a physiological account of the imagination or the senses.

Be that as it may, a reading of the *Meditations* that makes Descartes' conclusion regarding the essence of matter rely on the faculty of imagination is untenable, for it conflicts with the account of geometrical knowledge in that work, and extension is the object of geometry. Descartes' meditator contends that imagination alone would be insufficient as a faculty of geometrical knowledge, since the objects of

geometry actually grasped by the mind outstrip that faculty's representational power. In the Second Meditation, the meditator is brought to realize that he can comprehend the potential of the wax for an infinity of changes in shape and size, though he cannot imagine every distinct shape and size it might take on; in the Sixth Meditation, the meditator realizes that he can understand a chiliagon, even though he cannot picture its one thousand sides to himself.⁴³ In taking these points as an argument for the independence of the intellectual apprehension of geometrical objects from imagination, the meditator implicitly rejects the Aristotelian notion that the role of the intellect in geometry is to abstract geometrical universals (which would apply to an infinity of particulars) from a finite number of imperfect sensory and imaginal instances.⁴⁴ The only argument for regarding the intellect as an independent source of geometrical knowledge—other than the bare assertion in the Sixth Meditation that it is—comes in the Fifth Meditation (in continuation of the passage quoted above). The meditator remarks that the truth of various details of geometry "is obvious and so much in accord with my nature that my first discovery of them appears not as the learning of something new, but as the recollection of what I already knew—as the first occasion of my noticing things that had long been present to me, although I had never previously turned my mind's eye towards them" (AG, 101). Here one is presented with a putative experiential fact about geometrical truths—that they are unlearned, or that coming to affirm them is a matter of drawing out what is latent in the mind.

It is a rather straightforward matter to show that Descartes insisted on the doctrine that the objects of geometry can be grasped autonomously by the pure intellect. It is another matter to provide an interpretation of what it means to have a mental conception of a figure such as a triangle, pentagon, or chiliagon "without the aid of imagination" (AG, 110). How can one intellectually apprehend figure, independently of picturing it to one's self or seeing it?

One attractive answer embarks from Descartes' considerable contribution to the development of mathematical thought. A distinctive feature of Descartes' mathematics after the *Rules* is that it abandons the idea that all mathematical operations should be depictable in the imagination. In his *Geometry* proper Descartes developed the notion of a pure science of proportion, expressed in terms of algebraic equations and conceived in terms of proportions among line lengths.⁴⁵ Perhaps when Descartes spoke of a nonimaginal understanding of the triangle, he had in mind the kind of understanding that is embodied in knowing the equations for expressing the relations among

the sides of a triangle, deriving the area of a triangle, and so on. The "pure conceivings" of the intellect are in this manner assimilated to an algebraic understanding of continuous quantity and its proportional relations.

But what kind of understanding is that? The temptation of the twentieth-century mind to consider this as a kind of purely formal or symbolic understanding (whatever that would be) clearly will not do. Descartes scorned attempts to make words or symbols and formal rules for manipulating them primary; these are merely arbitrary sensory reminders for the content manifest in thought itself.⁴⁶ So even if we suppose the pure conceivings to be "algebraic," the question naturally arises of what it is like to contemplate a triangle algebraically, without the aid of imagination or of sensory props. Which puts us back at asking what it's like to have a pure conceiving of a triangle in the first place.

A second way of understanding this doctrine, which draws less on Descartes' actual mathematical results but which is more satisfying from an historical point of view, connects Descartes' doctrine of a nonimaginal understanding of geometry with the Platonic tradition, especially as expressed by Proclus, and thus forges a connection between this mathematical doctrine in the *Meditations* and the neo-Platonism in the Augustinian tradition of meditation.

Plato himself of course regarded mathematical studies as a means for leading the "eye of the mind" from the visible, sensible world to the invisible, intelligible world.⁴⁷ His suggestive remarks in the *Republic* regarding the division between sensibles and intelligibles, and between sensory and intellectual faculties, were elaborated at length by Proclus in his *Commentary on the First Book of Euclid's Elements* (a work well known to seventeenth-century mathematicians).⁴⁸ Proclus struggled long with the problem of how the immaterial mind can know the objects of geometry, which are extended and so apparently divisible, unless it employs the imagination (a corporeal faculty) to create an extended figure. But dependence on a corporeal substrate (even in the imagination as directed by the mind) would make geometrical objects, which are eternal and unchanging, partake of the changeable; in any case, how could there exist in the corporeal faculty of the imagination such ordinary geometrical objects as points without extension and lines without breadth? Although imagination may be the organ that presents us with palpable images of geometrical figures, the perfection of geometrical objects requires that they be knowable by the mind alone: "Plato calls geometrical forms 'understandables' and asserts that they separate us from sensible things and incite us

to turn from sensation to Nous [intuitive reason]—the ideas of the understanding being, as I said, indivisible and unextended, in keeping with the peculiar character of the soul."⁴⁹ The objects of pure geometry—points, lines, and surfaces without color or any sensory quality—belong to the domain of invisible, unchanging objects. Hence they must be known by a faculty appropriately directed toward that domain, the faculty of understanding (*dianoia*), which employs unitary (indivisible) ideas to grasp objects that are "separate" from sensible things.

It is in accordance with a Platonic account of mathematical understanding that I would interpret Descartes' doctrine that geometrical objects can be known by the mind independently of the imagination and senses. Yet Descartes was not properly a Platonist, for he replaced the theory of the forms with his theory of innate ideas. The "recollection" of geometrical truths by Plato's slave boy in the *Meno* is cast as a recollection of an earlier apprehension of the transcendent realm of the Forms; the escape from the cave in the *Republic* brings one directly to face with an external light.⁵⁰ For Descartes, the light of nature is an innate light.⁵¹ It retains a connection with the divine by virtue of its divine origin, but unlike the direct contemplation of the Forms it is not itself a grasping of the divine. Consonant with his desire to separate the contemplation and investigation of creation from the contemplation of the creator, Descartes has replaced the Platonic and neo-Platonic conceptions of the intellectual apprehension of eternal truths in terms of transcendental Forms, or *archae*, in the divine mind, with his conception of a natural light instilled in the mind by the creator. Moreover, the eternal truths embedded in this natural light are, according to Descartes, free and arbitrary creations of the divine will.⁵² The deity freely decrees the laws of geometry that define the essence of matter, and implants a natural light adjusted to those decreed laws in the created minds. In this manner, Descartes could defend the notion that he had a priori insight into the very essence of matter, without setting up a world of forms coeternal with God, and without audaciously having to claim direct insight into the mind of God itself.

IV

We have, on the one hand, the autonomy and priority of the intellect over the senses as a source of knowledge of the constitution of nature. On the other hand, there remains the project, intimated in the opening

quotation of this essay, of filling in various details about the natural world (such as the size of the sun). How are these details to be determined? A common answer has been that Descartes believed he could derive them in a wholly a priori manner, spinning all of natural science out of his first principles. However, the myth of Descartes as a complete a priorist with regard to natural science—a myth founded in seventeenth-century rhetorical exchanges and soberly recounted even in recent scholarship—should soon be put to rest by the increasing number of fine studies showing the systematic role assigned to experiment by Descartes in his conception of scientific method.⁵³ The explosion of this myth leaves the problem of precisely characterizing the relationships among experiment, sensory experience, and metaphysics in Descartes' mature thought; or between the details to be filled in empirically and the deliverances of the intellect.

One of the details to be filled in is the theory of the senses itself. In section 2 we saw that Descartes put forward a theory of the senses fully integrated with his mechanistic natural science and dualist metaphysics. The crux of this theory—and the part that makes it mesh with his natural science as a whole—is the distinction between primary and secondary qualities. At the end of section 2 the question of the justification of this account to the exclusion of an Aristotelian account was left unanswered. Let us now bring the results of section 3 to bear on this question, through an examination of the two strategies that Descartes employed in his mature works to win acceptance for a mechanistic conception of nature.

The first strategy was to reveal by concrete example the power of the mechanistic hypothesis to provide a unified and intelligible account of natural phenomena. Descartes employed this strategy in his earliest published writings. Thus, in the *Optics* and *Meteorology*, two of the three "essays" attached to the *Discourse on Method*, mechanistic accounts of the operation of the sense organs and of various natural phenomena near the surface of the earth are put forward under the umbrella of a few "hypotheses." The most general statement of these hypotheses, presented at the outset of the *Meteorology*, is that all natural bodies are composed of small particles of various shapes and sizes, such that even the smallest interstices are filled with very fine matter.⁵⁴ From this hypothesized corpuscularism (with plenum), Descartes proceeds to frame explanations not only of natural phenomena, such as vapors and exhalations, winds, and clouds, but also to account for the properties of objects that cause sensations in us, such as heat, color, and light, all by means of positing various motions in diversely shaped corpuscles. His justification for introducing this very general

form of mechanistic explanation, as he recounted it in various letters written in 1637 and 1638, was not a priori and metaphysical, but a posteriori and empirical. The pattern is hypothetico-deductive. Certain configurations of corpuscles—usually microscopic in size, and envisioned by analogy with macroscopic mechanisms—are posited to explain various phenomena, or "effects." Then, if the explanation is plausible, the causes may be "proven" by the effects. The more effects that can be explained by a given causal mechanism, the more probable that the cause is the true one: "It is true that there are many effects to which it is easy to fit many separate causes, but it is not always so easy to fit a single cause to many effects, unless it is the cause which truly produces them" (K, 58). Following this strategy, Descartes claimed his account of nature to be preferable to that of Scholastic Aristotelianism owing to its greater comprehensiveness and simplicity (K, 38–41, 43–44, 48–49, 55–59).

Any attempted a posteriori justification is limited by having to base its appeal on comparative advantages, such as intelligibility, simplicity, and comprehensiveness. But any merely comparative advantage cannot rule out the competition once and for all. Scholastic Aristotelianism provided one account of natural phenomena, which was closely integrated with an account of how these phenomena are known (via sense perception and intellectual abstraction). Descartes provided an alternative account, with an alternative theory of sense perception. According to the one, color is a real property of objects and is perceived via the transmission of a sensible species into the nervous system; according to the other, color is a sensation produced by mechanical agitation of the nervous system, which affects the mind with a sensation. Why should one accept that perceived color arises from microscopical particles agitating nerve fibers rather than from the reception of a "form" transmitted through the medium? Later natural philosophers might point to the successes of the new science as a justification for its acceptance. Descartes, however, was in the position of achieving acceptance for a view of nature which in fact had not yet produced remarkable comparative successes.

Descartes' second strategy was intended to provide the absolute justification he desired for his general conception of nature, by establishing that bodies have no other properties than modifications of extension. The success of this strategy depends upon showing that, of the various properties of objects seemingly manifest to the senses, extension and extension alone is clearly known (from which it is inferred, in accordance with the notion that God is no deceiver, that extension is the sole essence of bodies).

Prima facie, it is difficult to see why color as we experience it should be regarded as confused and obscure in comparison with shape. Phenomenally, color seems no more "out of focus"—confused and obscure—than the other dimensions of visual experience. Descartes granted as much in the *Principles*: "Pain, color, and so on are clearly and distinctly perceived when they are considered merely as sensations or thoughts" (*Principles* I, no. 68, AG, 194; cf. AG, 78–80). The difference comes when ideas are regarded as representing something external to the mind that has them; it is by comparison with the external standard of material nature itself that some sensory ideas are regarded as confused representations of their objects, whereas others are deemed clearer. But how is this comparison to be effected? If one proceeds empirically, it is difficult to see how to give a straightforward justification to the claim that ideas of shape more clearly represent the actual properties of objects than do ideas of color. Shape seems no more primitive and fundamental to our sensory experience than does color: colored things are always experienced as spatially articulated, but nothing is experienced as spatially articulated unless it varies in lightness or color. Perhaps later authors could claim that spatio-temporal properties are more thoroughly entrenched in scientific discourse, but that is partially as a result of the program that Descartes helped launch.⁵⁵

Descartes sought to solve the problem by appealing to a criterion outside the domain of sensory ideas. The difficulty of sorting among phenomenally given sensory ideas in order to determine their representational value is circumvented by appealing to a source of knowledge from which one can directly determine the sorts of properties that material objects may possess. The greater clarity attending the perception of shape is not, in the first instance, sense-perceptual; it is intellectual. By the natural light of the intellect, the only aspect of material things that can be clearly perceived or understood is pure, continuous quantity: the attribute of extension. Color isn't even a starter, since the objects of pure geometry as perceived by the intellect do not possess any sensory qualities. When the corrective judgments of the intellect are brought to bear on sensory ideas, it can be directly intuited that color is at best an obscure and confused representation of the geometrical properties of corporeal objects. Its comparative obscurity is determined not by a direct comparison with shape as experienced through the senses, but with the intellectual apprehension of shape as a geometrical property.

This strategy for sorting out sensory ideas applies to the whole of nature. Descartes' claim is that, a priori, the only sorts of explanations

that can be considered in natural science are ones that appeal only to geometrical properties such as size, shape, and motion. Metaphysics provides a way of setting aside other forms of explanation once and for all, in order to proceed with the elaboration of a mechanistic account of nature. Various particular mechanistic explanations cannot be defended on the basis of metaphysics alone, since mathematical intuition per se gives no direct insight into the particular geometrical configurations of actually existing bodies. The latter must be determined by sensory observation and experiment; by positing particular mechanistic hypotheses, and checking the empirical plausibility of the posit. Metaphysics reveals what kinds of properties can be used in constructing hypotheses; sensory observation and experiment must be used to determine which of these constructions fit the actual order of things.⁵⁶

V

A reading of the *Meditations* as meditations brings into prominence the extent to which its arguments and conclusions depend upon its guidance of the reader to certain experiences. The indubitability of the *cogito*, the apprehension of thought as something known independently of the body, the idea of a benevolent Supreme Being, the pure conception of extension without attendant sensory qualities—these are the experiences upon which depend the success of the *Meditations* in establishing Descartes' First Philosophy.

My emphasis on the experiential thrust of Descartes' chief work may seem to yield an implausibly (or uncomfortably) psychologistic interpretation. In fact, Descartes has been ascribed "the glory of having determined the true character of the psychological method" for searching after truth, thereby setting Locke on the pathway of investigating the phenomena of human understanding in his *Essay*.⁵⁷ Although Descartes did enjoin one to turn inward and to discover the givens of one's own experience, his method cannot patly be described as introspective. For Descartes was not asking one simply to look within. He was not interested in his own or his reader's passing psychological states. (Nor was he bringing the reader to an awareness of sense-data.)⁵⁸ Rather, he was hoping to help the reader discover, through the process of meditation, a source of impersonal, objective judgments that lies hidden in the intellect. The meditator is to sift through his own experience until he arrives at that which compels assent, and thereby to discover what lies behind the possibility of universal agree-

ment in such subject matters as mathematics and logic.⁵⁹ Descartes' "introspective" discovery of clear and distinct perception presumes to have arrived at the experiential basis behind the demonstrations of geometry.

Descartes has the meditator seek illumination for himself through the cognitive exercises of the *Meditations*. The need to experience illumination for one's self may be understood through Descartes' methodological writings. In both the *Rules* (esp. 5-7, 11) and the *Discourse* (pt. 2, AG, 20), intuition serves as the starting point for all knowledge. The Cartesian method seeks to begin with what is intuitively certain and to derive consequences by steps which themselves possess intuitive certainty. A discursive argument hence takes its life from purely mental intuition. Intuition—or, in the language of the *Meditations*, clear and distinct perception or intellectual illumination—is the starting point and the support of all progress in demonstrative knowledge, and therefore in First Philosophy.

Intuition can only be had for one's self. Whether in geometry or metaphysics, proper judgment of the truth results only when one feels one's own will compelled to give assent—compelled not by any external factor, but by one's own intellectual apprehension (AG, 96; HR I, 204). Descartes believed it more difficult to achieve self-illumination and self-guidance in metaphysics than in geometry. Geometry had achieved systematization and acceptance, presumably because its principles are among those "so clear that they may be acquired without any meditation" (HR I, 205). Metaphysics, while potentially possessing the certainty of geometry, appeared in relative disarray. Descartes explained in the dedication to the *Meditations* that, although the demonstrations contained therein

... are equal to, or even surpass in certainty and evidence, the demonstrations of Geometry, I yet apprehend that they cannot be adequately understood by many, both because they demand a mind wholly free from prejudices, and one which can easily be detached from affairs of sense. (HR I, 135)

Moreover, agreement was expected in geometry, and so the reader might be willing to give the benefit of the doubt. In metaphysics, Descartes was faced with the task of helping readers to achieve illumination despite prejudice or lack of faith. Hence, his requirement that one "meditate seriously" with him (HR I, 139).

Cartesian meditation is a method of discovery. Descartes explained his work in those terms in the second set of Replies. Pressed to formulate his First Philosophy in "geometrical fashion," he hesitantly complied, explaining the necessity for the meditative genre. While a geometrical exposition from definitions, postulates, and axioms has

demonstrative force at each step, it does not reveal how these steps are arrived at, nor does it bring one to a direct intuition of the first principles. This may not be of great moment for the exposition of geometry, since "the primary notions that are the presuppositions of geometrical proofs harmonize with the use of our senses and are granted by all" (HR II, 49). (Presumably it would hinder geometrical *discovery* to proceed always in this fashion.) The primary notions of metaphysics are quite otherwise, Descartes lamented. Here the problem is not to carry out proofs (which might well be assented to, given the definitions and axioms), but to discover the axioms themselves (which are hopelessly obscured by the prejudices of the senses). The reader cannot feel the intuitive force of these first principles until he apprehends them. Hence, the cognitive exercises of the *Meditations* are engineered to suspend prejudice through skeptical doubt, to exercise one's intuition through the illumination of the *cogito* and the proofs of God's existence, and to prepare one for the intuitive apprehension of mind and body as having distinct essences through the exercises of the Second Meditation, which are consolidated in the arguments of the Sixth Meditation. The *Meditations* is successful when it can be laid aside in favor of direct apprehension of the clear but remote principles of First Philosophy.

But does the sincere participant in a Cartesian retreat have the experiences called for by the *Meditations*? We are likely to have no problem in admitting the indubitability of the *cogito* (although the subsequent step to the separate substantiality of the mind will not find the same acceptance). But the same success will not be forthcoming with the appeal to an innate idea of God and to a direct mental perception of pure, continuous quantity. Although both theism and mathematics persist, they do so without the cognitive foundations envisioned by Descartes.

What did Descartes have in mind in staking his claims on these experiences? He did not, I think, intend that what we might (inappropriately) call the "mere" (but nonetheless considerable) literary merits of the text should carry the day. Rather, his choice of the meditative genre reflected his serious commitment to invoking these experiences in the reader, in accordance with his methodology of intuition. That he could reasonably expect to do so for his audience, and that the expectation no longer is reasonable, reveals the extent to which this most ahistorically conceived of texts is historically conditioned. Just as those places in his writing where Descartes believed he was pointing the way to an unconditioned intuition of the truth, we find that the very intelligibility of his text requires the deepest historical analysis.

Descartes could expect to invoke the appropriate responses in (some

of) his readers because the *Meditations* drew on two ongoing practices: spiritual meditation and speculative mathematics. We have seen that, in the Augustinian tradition of meditation, one sweeps away the sensory world in order to see God with the eye of the mind. Similarly, in the neo-Platonic mathematical tradition, one uses the imagination as a convenient aid to display the continuous proportions that are known to pure intellect. No matter what the practitioners of this regimen actually did experience (could this be decided?), the account they each gave of their practice included the intellectual apprehension of God on the one hand and of the objects of mathematics on the other. There existed communities of meditators and mathematicians in the time of Descartes who were used to describing their experiences in the manner of the *Meditations*.

Yet one cannot rest content with totally relativizing Descartes to this historical context, for his work continues to speak. One way in which it speaks is through its appropriation by philosophical traditions indifferent (or antipathetic) to Descartes' intellectualist metaphysics, as when the First Meditation is used as a standard statement of skepticism in the teaching of twentieth-century sense-data epistemology. Here, a more recent philosophical tradition makes of Descartes what it will. But in another sense Descartes must speak to us because he was on to something. Even if one does not find force in the reasons Descartes gave for accepting his project of natural science, his conception of the project was nonetheless efficacious. His vision of a unified celestial and terrestrial physics that emphasized spatio-temporal properties planted seeds for the development of modern physical thought that bore fruit in Newton. Moreover, Descartes stands at the beginning of modern philosophical investigation into the relation between the knower and the known. Even if we no longer are taken with his foundationalist enterprise, his epistemic individualism, or his account of cognitive faculties, the problematic of characterizing the contribution of the knower (or community of knowers) to the very constitution (or fabrication) of knowledge remains. Not only does the tradition make (what it will of) Descartes; Descartes has made the tradition.⁶⁰

NOTES

1. AG—*Descartes: Philosophical Writings*, trans. Elizabeth Anscombe and P. T. Geach (Indianapolis: Bobbs-Merrill, 1971). For an explanation of the abbreviations AT, HR, and K, see the General Bibliography at the beginning of this volume. Op—*Discourse on Method; Optics, Geometry, and Meteorology*, trans. Paul J. Olscamp (Indianapolis: Bobbs-Merrill, 1965).

2. Thomas Aquinas, *Summa Theologica*, pt. 1, qu. 12, arts. 11–12; qu. 84, art. 7; qu. 85, art. 1. Here and below I contrast Descartes' position with an Aristotelian position, which, of course, need not have been Aristotle's position (though, as in the present case, it may have textual support in Aristotle—cf. *De Anima*, bk. 3, chap. 4, 429a18–29, and chap. 8, 432a3–14). The Aristotelian position sketched constitutes a common medieval and seventeenth-century interpretation of Aristotle, via Thomas.

3. This important function of the doubt has been emphasized by E. M. Curley in *Descartes Against the Skeptics* (Cambridge: Harvard University Press, 1978), chaps. 2–3; and by Margaret Dauler Wilson in *Descartes* (London: Routledge & Kegan Paul, 1978), chap. 1.

4. These are the second and third of three uses for the doubt given by Descartes in his reply to Hobbes (*Objections and Replies III: HR II*, 60–61). The antiskeptical thrust of Descartes' work has been emphasized by Richard H. Popkin in *The History of Skepticism from Erasmus to Spinoza* (Berkeley, Los Angeles, London: University of California Press, 1979), chap. 9.

5. Ignatius's *Constitutions of the Society of Jesus* (trans. George E. Gauss, based on the final Spanish text of 1594 [St. Louis: Institute of Jesuit Sources, 1970]) established Aristotelian philosophy as the official doctrine of the Jesuits in logic, natural and moral philosophy, and metaphysics; Aristotelian features of his *Spiritual Exercises* will become apparent below. Eustace of St. Paul's *Exercices Spirituels* (Paris, 1630; 2d ed., 1640) emphasized the Augustinian doctrines of continuous creation (pt. 1, Meditation 3) and the efficacy of grace above understanding and will (pt. 1, Meditation 19). Eustace was an acquaintance and correspondent of Pierre de Bérulle, and so was connected with the circle of Descartes. His *Exercices* was written in Paris during the 1620s and presumably was in use, for in 1626 Pope Paul V authorized a plenary indulgence for all who practiced *les exercices* for ten days. For a general comparison of Jesuit and Augustinian thought in seventeenth-century France, see Robert G. Remsberg, *Wisdom and Science at Port-Royal and the Oratory: A Study of Contrasting Augustinianisms* (Yellow Springs, Ohio: Antioch Press, 1940).

6. Yearly retreats were an integral part of the curriculum at Jesuit colleges such as Descartes' La Flèche; Camille de Rochemonteix, *Un Collège de Jésuites aux XVIIe et XVIIIe Siècles: Le Collège Henri IV de la Flèche*, 4 vols. (Le Mans, 1889), 2:140–142. A helpful discussion of the relations between Descartes and members of the Parisian Oratory is provided by A. Espinas in his "Pour l'Histoire du Cartésianisme," *Revue de Métaphysique et de Morale* 14 (1906):265–293. L. J. Beck, in *The Metaphysics of Descartes* (Oxford: Clarendon Press, 1965), chap. 2, sec. 2, provides an interesting discussion of the connection between the *Meditations* and Ignatius's *Spiritual Exercises*.

7. Ignatius of Loyola, *The Spiritual Exercises*, 4th ed., trans. W. H. Longridge (London: Mowbray, 1950), First Week, First Exercise, 52–57; *The Directory to the Spiritual Exercises* (ibid.), chap. 14, secs. 2–3 (the directory was prepared by Ignatius's followers). The treatment of memory, understanding, and will as the three powers of the soul stems from Augustine's *Trinity*, bk. 10, chaps. 11–12. In the *Confessions*, Augustine describes his search for Christian faith in terms of these three powers: on the memory, see bk. 10, chaps. 8–25; on

the understanding, bk. 7, chaps. 10 and 18; on the will, bk. 8, chaps. 5, 7, and 12. The doctrine became commonplace; see, for example, Francis de Sales, *An Introduction to a Devoute Life*, trans. J. Yakesley (Douai, 1613), pt. 2, 138–143. I am indebted to Katharine Park for discussion of various doctrines concerning the powers and faculties of the soul.

8. *Directory*, chap. 39. Augustine passes through parallel stages in the *Confessions*: purging the senses and turning to intellectual illumination (bk. 7, chaps. 10 and 17), and seeking to unite his will with God's (bk. 9, chap. 1). Early seventeenth-century meditative works were often divided in accordance with the three ways: de Sales, *Devoute Life*, pts. 1, 2, and 3–4; Eustace, *Exercices* (three parts).

9. De Sales labels these "considerations" for the understanding as the "meditation proper," *Devoute Life*, pt. 2, 138.

10. Adolphe Tanqueray, *The Spiritual Life*, trans. H. Brandeis (Westminster, Maryland: Newman, 1948), 300; *Directory*, chap. 14, sec. 3.

11. On Augustine's conception of illumination, see Ronald H. Nash, *The Light of the Mind: St. Augustine's Theory of Knowledge* (Lexington: University Press of Kentucky, 1969), chap. 6–8.

12. The paucity or the poorness of argument in one or another portion of the *Meditations* is frequently remarked in recent critical work; see for example Bernard Williams's treatment of the Second Meditation passage on wax, and the Fifth Meditation statement on the essence of matter, in *Descartes: The Project of Pure Enquiry* (New York: Penguin, 1978), chap. 8. Of course, much of what I maintain that Descartes put forward as known by what I have termed "exemplification"—such as that what is clearly known in body constitutes its essence (AG, 101, heading and second paragraph; cf. *Principles* I, 53–54)—depended on tacit assumptions within the context of philosophical thought that Descartes worked. We might choose to draw these assumptions out as premises in a reconstructed argument, but at present we're interested in characterizing Descartes' conception of the force of the *Meditations*. In the concluding section of this essay I will examine what remains of this force.

13. As Pierre Courcelle has shown in his very useful *Les Confessions de Saint Augustine dans la Tradition Littéraire* (Paris, 1963), Augustine's *Confessions* was used in various ways during the Middle Ages and Renaissance. In the eighth and ninth centuries it was excerpted and rearranged along thematic lines as a doctrinal work; interest in its autobiographical character increased in the tenth and eleventh centuries (pt. 2, chap. 2). By the twelfth century, it was being recommended as a means for turning inward to a direct contemplation of God, and as a guidebook to the reform of one's own conduct (chap. 3). Devotional works in the Augustinian tradition arose, including Bonaventure's *The Mind's Road to God*, trans. George Boas (Indianapolis: Bobbs-Merrill, 1953).

14. *Summa theologica*, pt. 2, 2d pt., qu. 82, art. 3.

15. Ignatius, *Exercices*, First Week, Fifth Exercise.

16. St. Augustine, *Confessions*, trans. A. C. Outler (Philadelphia: Westminster, 1955), bk. 7, chap. 25, art. 36.

17. *Ibid.*, bk. 4, chap. 15, art. 31; bk. 5, chap. 10, art. 19, and chap. 12, art. 25; bk. 6, chap. 3, art. 4; and bk. 7, chap. 1, arts. 1–2.

18. *Ibid.*, bk. 7, chap. 1, art. 1.

19. *Ibid.*, bk. 5, chap. 10, art. 19, and chap. 14, art. 25. Augustine explicitly mentions Academic skepticism.

20. *Ibid.*, bk. 7, chap. 17, art. 23. This passage just hints at the role of immediate knowledge of the self in Augustine's overcoming skeptical doubt; that role is made explicit in the *Trinity* (bk. 9, chaps. 3 and 4; bk. 10, chap. 3, art. 5, and chap. 4, arts. 14–16) and in *De Libero Arbitrio* (bk. 2, chap. 3). Arnauld pointed out the kinship of the last with Descartes' *cogito* (HR II, 80).

21. *Objections and Replies II* (HR II, 49–50). The passage continues further on: "This is why my writing took the form of *Meditations* rather than that of Philosophical disputations or the theorems and problems of a geometer." See also the prefatory material to the *Meditations* (HR I, 135, 139, 140), where the need to withdraw the mind from the senses is repeatedly emphasized.

22. Among the numerous admonitions to spend days or weeks on the First Meditation alone, many are found in the *Objections and Replies II* (HR II, 31). Such admonitions were a common feature of devotional meditations.

23. *Confessions*, bk. 7, chaps. 24–25, arts. 35–36.

24. Descartes uses memory to recall old opinions about the nature of the mind (Second Meditation: AG, 67–68) and about "the real" (Sixth Meditation: AG, 111–113). These remembered doctrines contain several Aristotelian shibboleths, including the definition of man as a "rational animal" (AG, 67) and the meditator's belief that "I had nothing in my intellect that I had not previously had in sensation" (AG, 112).

25. As Richard Kennington has pointed out in his interesting article, "The 'Teaching of Nature' in Descartes' Soul Doctrine" (*Review of Metaphysics* 26 [1972]:85–117), Descartes introduces his work in the letter to the Sorbonne by emphasizing its apologetic aims, but soon replaces the original faithful/in-fidel dichotomy with a division between the philosopher and those "who arrogantly combat the truth" (HR I, 136). In the Synopsis and the First Meditation the cognitive aims of the work are made evident.

26. Descartes explicitly states his intention that the *Meditations* should accommodate the reader's mind to the foundations of his physics (letters to Mersenne, 11 November 1640 and 28 January 1641 [K, 82, 94]).

27. Augustine attains a glimpse of the highest being by means of his own intellectual powers (*Confessions*, bk. 7, chap. 17, art. 23, quoted above). In the end, however, abiding knowledge of God is granted him only through grace (bk. 7, chap. 12, art. 29). The recurrent Augustinian slogan, "First believe, then understand," marks the dependence of understanding on faith and hence on grace (see Nash, *Light of the Mind*, chap. 3). Eustace mortifies the intellect and declares its dependence on the light of grace in the *Exercices Spirituels* (pt. 1, Meditation 19).

28. "Whatever the light of nature shows me (e.g. that if I am doubting it follows that I exist, and so on) is absolutely beyond doubt; for there can be no faculty, equally trustworthy with this light, to show me that such things are not true" (AG, 79).

29. Even if one regards this derivation as circular, it nonetheless does depend on the natural light.

30. Descartes is quite explicit about delimiting what he calls "theology proper," which treats of matters that depend on revelation, from metaphysics, which, even if it treats of God, does so within the bounds of human reason (letter to Mersenne, 15 April 1630 [K, 10]; cf. letter to Mersenne, 27 May 1630 [K, 15]). He criticizes Comenius for seemingly wanting "to combine religion and revealed truths too closely with the sciences which are acquired by natural reasoning" (letter to Hogeland, [?] August 1639 [K, 60]). In the *Discourse*, pt. 1, he characterizes theology as requiring "aid from heaven" (AG, 12). On his doctrine that we all share the same natural light, see *ibid.* (pp. 7–8) and a letter to Mersenne, 16 October 1639 (K, 66).

31. Descartes' chief accounts of sensory physiology and psychology occur in the *Treatise on Man*, trans. T. S. Hall (Cambridge: Harvard University Press, 1972), 35–68 and 91–100; *Optics*, esp. pts. 4–6; *Principles* IV, nos. 187–200; and *Passions of the Soul*, pt. 1, arts. 12–35 (HR I, 337–348). His chief accounts of the cognitive and metaphysical aspects of sense perception outside the *Meditations* occur in the fourth set of Objections and Replies (HR II, 105–107) and in the *Principles* I, nos. 66–74.

32. Aristotle, *De Anima*, bk. 2, chaps. 5–7, and 12, and bk. 3, chaps. 1–2; Aquinas, *Aristotle's De Anima in the Version of William of Moerbeke and the Commentary of St. Thomas Aquinas*, trans. K. Foster and S. Humphries (New Haven: Yale University Press, 1951), commentary on the passages just cited, esp. secs. 418 and 551–554. I have discussed various Aristotelian accounts of sense perception and compared them with Descartes' account in an article with William Epstein, "The Sensory Core and the Medieval Foundations of Early Modern Perceptual Theory," *Isis* 70 (1979):363–384.

33. *Optics*, pt. 5; *Passions*, pt. 1, 10–16; *Treatise on Man*, 83–86.

34. Descartes characterizes this sensation in terms of its "extension . . . , its boundaries, and its position relatively to the parts of my brain" (HR II, 252).

35. HR II, 252. Here Descartes explains distance perception solely in terms of unnoticed judgments, thereby suggesting a reading of the celebrated "natural geometry" passage in the *Optics*, pt. 6 (Op, 106) in terms of implicit reckoning. However, in the *Treatise on Man*, he explained distance perception in a nonjudgmental, psychophysical manner, as directly elicited by brain events (pp. 61–63 and 94), which is consonant with the statement in the *Optics* that the act of thought in natural geometry is "a simple act of imagination" (Op, 106). The intellectualist emphasis in the passage from the Objections and Replies may have arisen from the fact that here Descartes is speaking more as a philosopher than as a sensory physiologist, and so is seeking a close fit between his metaphysics and theory of the senses; see Nancy Maull's insightful article, "Cartesian Optics and the Geometrization of Nature," in Stephen Gaukroger, ed., *Descartes: Philosophy, Mathematics and Physics* (New Jersey: Barnes and Noble, 1980), 23–40.

36. Descartes' account of judgment makes both will and intellect essential (Fourth Meditation; *Principles* I, nos. 32–35). The intellect merely apprehends, whereas the will affirms and denies (being irresistibly drawn to affirm what the intellect apprehends clearly and distinctly). In the passage under discus-

sion, Descartes uses *intellectu* to refer to the operation of the will and intellect together in judging (AT VII, 436–439).

37. Aristotle, *De Anima*, bk. 3, chap. 3, 427b. Descartes, Third Meditation (AG, 78).

38. Third Meditation (AG, 83–84); Objections and Replies IV (HR II, 105–107).

39. Descartes broke off work on the *Rules* in 1628; the work was first published in 1701. In the *Rules* the doctrine that the world is best described mechanistically grows out of the claim that such a description provides the clearest account of the operation of the senses, and of the relationship between the sense organs and the things sensed (Rule 12); geometrical knowledge is founded on an account of the faculty of imagination (Rule 14; see n. 42, below). See John A. Schuster, "Descartes' *Mathesis Universalis*, 1619–1628," in Gaukroger's *Descartes*, 41–96, esp. pt. 3.

40. In a letter to Mersenne of 15 April 1630, Descartes declared that "I have found how to prove metaphysical truths in a manner which is more evident than the proofs of geometry" (K, 11); the letter suggests that this discovery derived from the use of reason to know God and the self, and that it allowed him to discover "the foundations of Physics" (K, 10). This programmatic statement fits well the strategy of the *Meditations*; Descartes may have been discussing the results of his work on an early version of the *Meditations* during the previous nine months (AT I, 17, 182; K, 19; Beck, *Metaphysics*, chap. 1, sec. 1).

41. Denumerability and temporal duration apply to both mental and material substance; geometrical modifications are proper to matter, see *Principles* I, nos. 48 and 55.

42. HR I, 56–59; see Schuster, "Mathesis Universalis," 64. Margaret Wilson (in her *Descartes*, 169–171) argues that in the *Meditations*, too, geometry is made to depend on the imagination.

43. In the Second Meditation, remarking on the ability of the piece of wax to take on an indefinitely large number of figures as it is heated, the meditator concludes that "I should mistake the nature of wax if I did not think this piece capable also of more changes, as regards extension, than my imagination has ever grasped" (AG, 73). From this he concludes that the nature of wax—specifically, the wax as an extended thing—is known "not by imagination, but by purely mental perception"; and further on: "the perception of wax is not sight, not touch, not imagination; nor was it ever so, though it formerly seemed to be; it is a purely mental contemplation" (AG, 73), effected by the "mental power of judgment" (AG, 75). In the Sixth Meditation the meditator affirms that geometrical figures such as the triangle, pentagon, and chiliagon can be known by the understanding independently of imagination, and that intellection, but not imagination, is essential to the nature of mind (AG, 109–110). See also HR II, 229 and 66.

44. Aquinas, *Commentary on the Metaphysics of Aristotle*, 2 vols., trans. John P. Rowan (Chicago: Regnery, 1961), bk. 3, lesson 7 (on *Metaphysics*, bk. 3, chaps. 2–3) and bk. 11, lesson 3, esp. sec. 2202.

45. In Rule 14 Descartes sought to ground all of mathematics in the imag-

ination of geometrical (figural) displays of arithmetic units and the operations performed on them. The project collapsed in the attempt to extend it (in Rules 18 and 19) to the extraction of roots and the solution of higher-order equations. Compare with the opening paragraphs of the First Book for the *Geometry*. For a helpful treatment of these matters, see Schuster, "Mathesis Universalis," pt. 3, and the more extensive treatment in his doctoral dissertation, "Descartes and the Scientific Revolution, 1618–1634" (Ann Arbor: University Microfilms, 1977), chap. 6.

46. Objections and Replies III (HR II, 66 and 69).

47. *Republic*, bk. 7, 524c–531d. It is difficult to determine the degree to which Descartes was acquainted with actual texts of Plato. He mentions Plato's account of Socrates' last days in a quite offhand manner (suggesting familiarity) in two letters to Elizabeth, November 1646 (AT IV, 530) and 22 February 1649 (AT V, 281); otherwise, there is no mention of Plato in the correspondence. Plato is characterized as a skeptic in the Author's Letter to the *Principles* (HR I, 206); the same letter uses one of Plato's images in the phrase "living without philosophy is just having the eyes closed without trying to open them" (HR I, 204), cf. *Republic*, bk. 6, 506c. Platonic thought infused the Oratory (see Espinas, "l'Histoire du Cartésianisme").

48. Proclus, *Commentary*, trans. Glenn R. Morrow (Princeton: Princeton University Press, 1970), bk. 1, chaps. 5–6, bk. 2, chap. 1. The works of Proclus (fifth century A.D.) as well as other neo-Platonic mathematical writings, were widely available by the sixteenth century, and were much discussed in the prefaces to mathematical works after that time; see Edward W. Strong, *Procedures and Metaphysics: A Study in the Philosophy of Mathematical-Physical Science in the Sixteenth and Seventeenth Centuries* (Berkeley: University of California Press, 1936), chap. 8. Christopher Clavius' edition of Euclid's *Elementorum* (Rome, 1603), which was used at La Flèche in Descartes' day, contains typical mention of Proclus' teaching that mathematics sharpens the eye of the mind for considering things apart from matter, thus preparing one for contemplation of the divine (pp. 15–19). Incidentally, in the *Meditations* this process is reversed; contemplation of God and the soul are used to reveal the foundations of physics in the conception of pure extension.

49. Proclus, *Commentary*, 40.

50. *Meno*, 81b–86b; *Republic*, 514a–518d.

51. Descartes to Mersenne, 15 April 1630 and 16 June 1641 (K, 11 and 104).

52. See the letters to Mersenne from 1630 (K, 10–15). See also Emile Bréhier, "The Creation of the Eternal Truths in Descartes's System," in Willis Doney, ed., *Descartes: A Collection of Critical Essays* (Notre Dame: University of Notre Dame Press, 1967).

53. Such studies, too numerous to list, range from Ralph M. Blake, "The Role of Experience in Descartes' Theory of Method," *Philosophical Review* 38 (1929):125–143 and 201–218, through Alan Gewirth, "Experience and the Non-Mathematical in the Cartesian Method," *Journal of the History of Ideas* 2 (1941):183–210, to chap. 7 of Williams's *Descartes*.

54. Op, 264. A strategy similar to the one described above can be found in the opening chapters of *Le Monde* (AT, XI).

55. Boyle and Locke argued for the distinction between primary and secondary qualities, not on metaphysical grounds but on the basis of the utility and clarity of the mechanistic hypothesis; see Boyle's *About the Excellency and Grounds of the Mechanical Hypothesis* (London, 1674) and Locke's *Essay Concerning Human Understanding* (London, 1690), bk. 2, chap. 8 together with bk. 4, chap. 3, secs. 24–26 and chap. 12, secs. 10–13.

56. Descartes' most explicit published statement of the need for experiment comes in the *Discourse*, pt. 6 (HR I, 120–121).

57. Francisque Cyrille Bouillier, *Histoire et Critique de la Révolution Cartésienne* (Lyon, 1842), 380–386, quotation from p. 380. My paraphrase of Bouillier's statement about Locke is not intended as an endorsement.

58. It is not uncommon to find Descartes discussed as if he were seeking to reconstruct the world out of incorrigibly known sense-data (a venerable project from the early part of our century); e.g., Richard Rorty, *Philosophy and the Mirror of Nature* (Princeton: Princeton University Press, 1979), chap. 1, sec. 2, esp. p. 30. Descartes was seeking to go from the mind to the world, but the bridge is, in the first instance, via intellectual intuition, not sensory ideas.

59. Descartes' conception of truth as that which compels assent from any unprejudiced judge finds expression in the *Rules*, Rule 2 (HR I, 3) and the *Discourse*, pts. 1–2 (AG, 11–12, 21–23).

60. My debts are too numerous to thank all explicitly, but all are thanked. I must especially express appreciation for the helpful criticism and conversation of Wilda Anderson, John Carriero, Hannah Ginsborg, Owen Hannaway, Paul Hoffman, David Lindberg, John Rogers, Amélie Rorty, and David Sachs. I also express gratitude to the American Council of Learned Societies for financial assistance, which allowed me to work on the paper while enjoying the hospitality of the Department of Philosophy of Harvard University as a Visiting Scholar.