WOLF, Celia Rose Curtis
THE RETREAT FROM REALISM: PHILOSOPHICAL THEORIES OF VISION FROM DESCARTES TO BERKELEY

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THE RETREAT FROM REALISM: PHILOSOPHICAL THEORIES OF VISION FROM DESCARTES TO BERKELEY

A thesis submitted to the Graduate School of the University of Wisconsin-Madison in partial fulfillment of the requirements for the degree of Doctor of Philosophy

by

Celia Rose Curtis Wolf

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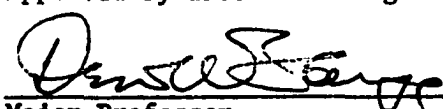

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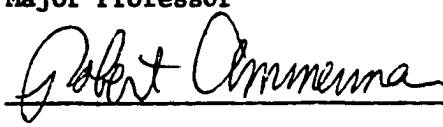

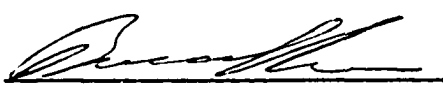

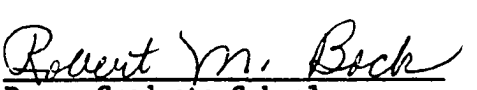

Dean, Graduate School

THE RETREAT FROM REALISM: PHILOSOPHICAL THEORIES OF VISION FROM DESCARTES TO BERKELEY

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Celia Rose Curtis Wolf

A thesis submitted in partial fulfillment of the requirements for the degree of

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PREFACE

As is customary, I would like to express my appreciation for those who have made this work possible. The University of San Francisco, the University of California in Berkeley and the Graduate Theological Union are to be thanked for permitting me to use their libraries. Many thanks are also due my dissertation advisor, Dennis Stampe, for patiently reading my drafts and staying with me during what turned out to be a very long haul.

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I am very grateful also to my friend Edith Black, without whose friendship and encouragement I would never have finished this, to Mrs. James Dowd for her support, and to Sedgwick, Detert, Moran & Arnold who kindly permitted me to use their word processor for the preparation of the manuscript.

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INTRODUCTION

The purpose of this essay is to arrive at a deeper understanding of the roots from which the kind of perceptual idealism we find in Berkeley's works developed. To do this we must place it within its historical context.

The seventeenth century was, is well known, a period of great change, accompanied by considerable ferment in the philosophical world. The Aristotelean system which had held sway for so long was breaking down, largely under the assaults made upon it by the rising tide of the new mechanistic physics, typified by the work of Galileo and Newton. The new physics was meeting with considerable resistance, however, especially from the Jesuits, because it was perceived as a return to the materialism of the Greek atomists, and therefore as a threat to the Christian religion.

Descartes had an important role to play in bringing about the eventual victory of the mechanistic world view over the Aristotelean one. What he did was to attempt to provide a new philosophical framework which would meet the needs of the new physics, while at the same time establishing those truths considered essential to the Christian religion -- namely the existence of God and the immortality of the soul.

The theory of vision, for a number of reasons, played a central role in Descartes' struggle with the Aristoteleans, and it continued to have a very central role throughout the period from Descartes through Berkeley. Optics had been a well-developed discipline throughout the middle ages, and all educated people in the 17th century were knowledgeable about it. Our sense of sight is our most important sense, and how we understand it deeply affects our understanding of the world. These reasons alone would make it necessary for any new philosophical system to be able to provide an acceptable theory of vision.

Vision was, in addition, especially important for Descartes in his struggle with the Aristoteleans for several special reasons. First, Descartes denied the existence of what they had called "real qualities" or sensible qualities, and he believed that they had been forced to postulate these mainly in order to explain perception. Thus if he could explain our perception of a sensible quality such as color in a purely mechanical way, and without recourse to forms or real qualities, this would show that philosophy could do without these Aristotelean notions entirely. Secondly, since sight had traditionally been held to be the most intellectual or spiritual of the senses, a successful mechanistic explanation of vision would be particularly impressive. His Dioptrics and portions of l'Homme, undertake to provide such an explanation.

Optics did not cease to be important after Descartes. Malebranche, Locke and Berkeley all either did original work in optics and the theory of vision themselves, or were at least familiar with the most current work in the area, and therefore their thought about perception was very much dominated by the model of vision. Philosophical and scientific considerations were very closely interwoven in their work, and it was in the course of their struggles with specific problems in the theory of vision that their thought about perception developed.

In 1705 there emerged on the scene a radically different theory of vision, the Essay Towards a New Theory of Vision, the work of the young Irish philosopher, George Berkeley. It was intended as an attack on the new mechanistic philosophy, and as a powerful argument for Berkeley's own philosophy of "immaterialism" -- a philosophy which he believed was more consistent philosohpically, and less vulnerable to scepticism, as well as more supportive of the truths of the Christian faith than its rival. Like Descartes, Berkeley selects vision as a kind of showpiece or illustration of the explanatory power of his own philosophical principles. Some of his reasons for selecting vision are doubtless the same as Descartes' -- namely its centrality to our way of conceiving the world and the popularity of optics which would guarantee his essay a wide audience.

He also selected vision, we shall argue, because certain of the changes Descartes had made in the Aristotelean theory of perception as they had evolved through the work of Malebranche and Locke, already had an implicitly idealistic tendency, and Berkeley saw that by bringing together certain already existing strands of thought, he could develop a novel and compelling argument for the ideality of the objects of sight -- an argument which would bring the prestige of science to bear to support idealism.

Berkeley's position in the NTV can be called "visual idealism" to distinguish it from the more general idealism of his later works.

For the purposes of our discussion here, we shall take the four following claims to be constitutive of visual idealism: 1) There is a distinction between what we immediately or directly see and what we perceive by means of this; 2) what we immediately or directly see exhausts what we have access to through sight, strictly speaking; 3) physical objects are never immediately or directly seen; and 4) what is immediately seen is mental in nature, and has no existence outside the mind of the perceiver.

It is a seldom noted, and rather interesting fact, that this sort of visual idealism was virtually unknown in the ancient world, even though numerous forms of scepticism and subjectivism flourished. In fact, Berkeley's presentation of it is, to my knowledge, the first. And the reason

why this is the case, we shall argue, is because it was the changes which Descartes had made in the then-prevailing Aristotelean framework for explaining perception which made possible the sort of perceptual idealism we find in Berkeley's work. Although the Aristotelean system suffered, perhaps, from different problems, it did not generate the same set of problems which the Cartesian one did, and Berkeley's argument for visual idealism relies upon premises which were based upon Cartesian rather than Aristotelean assumptions.

In the first chapter we shall examine Aristotle's theory of perception, and vision in particular. This will include both scientific material and a discussion of how some of his key metaphysical concepts, such as matter and form, act and potency, and his understanding of the relation between soul and body, affect and indeed shape his understanding of perception. This will put us in a position to better understand the importance of the changes which Descartes introduced.

The next three chapters will deal with Descartes' account of perception, with an emphasis on vision, presented against the backdrop of the Aristotelean account. Chapter II will trace his increasingly sharp break with the Aristotelean-Scholastic tradition, emphasizing his account of perception in Rule XII. Chapter III will focus upon his mechanization of the objects of sight, namely light and

color, and on the importance of his work in this area for the struggle between the new mechanistic science and the Aristoteleans. Chapter IV will cover his attempt to explain the processes of perception within the perceiver, how we visually perceive light, color, situation, distance, size and shape, and the subtle interweaving of philosophical and physiological factors in his explanation.

The final chapter will briefly sketch the way in which Descartes' theory of vision evolved, through the work of his successors, in an increasingly idealistic direction, culminating with the publication of Berkeley's NTV in 1705. In order to make this topic manageable, several main strands of thought have been selected, specifically the emergence of ideas as inner objects of perception,[1/] the subjectivization of light and color, and the increasingly sharp distinction between seeing and judging according to which distance came to be regarded as judged, not seen.

1/ In tracing the development of the view that ideas are the immediate objects of perception, the term "representationalism" will occasionally be used. This term is properly used to cover any view according to which perceiving is analyzed in terms that postulate a representation of the thing perceived, however that representation is held to be related to the subject or the perceptual state of the subject. I wish, however, to use it here in a more restricted sense to refer to those views which hold that we have, in perception, an immediate or direct perception of some sort of representation of the object (whether that representation is physical or mental).

These will be traced through the work of Malebranche and Locke to their culmination in the NTV, where it will be shown how Berkeley weaves these strands of thought together in his argument of the first 51 sections of the NTV -- the sections in which he establishes the claims 1-4 listed above -- taken to constitute visual idealism.

In the conclusion, we will briefly show how differently the Aristotelean tradition handled these same issues. It will be suggested that Aristotle's matter/form, and act/potency distinctions, and his view of the relation of soul and body, prevented him from seeing ideas as inner objects. His insistence on the reality of the qualitative aspects of the world kept him from subjectivizing light and colors. And, finally, his theory of the role of the common sense in perception kept him from the sharp separation of seeing and judging which developed within the Cartesian tradition.

Thus although the Aristotelean system certainly had its own set of problems, it did not provide a philosophical climate within which the sort of perceptual idealism we find in Berkeley could develop.

CHAPTER I

ARISTOTLE'S THEORY OF PERCEPTION

In order to understand the significance and novelty of Descartes' theory of perception, we must look at it against the backdrop of the Aristotelean system which had dominated Western thought for so many centuries. Although Descartes inherited from his teachers at La Fleche an Aristoteleanism modified by the interpretations and accretions of late scholastic philosophy, its basic concepts and assumptions were still Aristotelean. Thus it is appropriate to focus on Aristotle himself rather than becoming entangled in the intricacies of scholastic philosophy, especially since Descartes himself regarded Aristotle as his main rival.

Accordingly, then, the purpose of this chapter will be to present a rudimentary account of Aristotle's theory of perception, with an emphasis on vision, so that this can provide a point of reference for our discussion of Descartes.

The distinctive features of Aristotle's theory of perception are a function both of the general metaphysical framework within which he approaches the problem, and also of the physiological and scientific knowledge of his time, which was extremely rudimentary relative to, e.g., that available to Descartes. Thus, we will need to look at both of these factors in order to have a thorough understanding

of Aristotle's theory of visual perception. The metaphysical framework will be discussed first, both because it very much shapes the way Aristotle interprets the physiological and scientific data available to him, and also because it is these basic underlying metaphysical assumptions which enable Aristotle to explain perception in a way which does not involve ideas emerging as intermediaries between the mind and the world.

Our main text for this is the De Anima (DA). When we get more into the concrete details, and also for our discussion of the common sense, the four short treatises of the Parva Naturalia will be brought in. Unless otherwise specified, all citations are from the DA, and are from the Moerbecke translation (the one in general use in Descartes' time). Citations from the Parva Naturalia treatises are from the Beare translation. Considerable critical literature exists discussing both the order in which these works were written, and, relatedly, whether or not they are consistent, especially in their discussion of the common sense. The position taken here is that the DA and the Parva Naturalia treatises are essentially consistent, although it is beyond the scope of this essay to defend this assumption in any general way. The interested reader

is referred to a recent article by Charles Kahn[1/] and to other sources listed below.[2/]

I.

METAPHYSICAL FRAMEWORK

Since sensation is a power of certain kinds of living things, we must first look at it in this broad context, considering what things have the power of sensation and why. This will involve us in a brief discussion of the soul and its role in sensation. Following this, we will step back and look at the way in which Aristotle's two great philosophical distinctions -- between potentiality and actuality on the one hand, and between matter and form on the other hand -- set up the framework within which he sets out to explain visual perception.

A. Sensation and the Soul

For Aristotle, as for Descartes, the soul has a very central role in explaining sensation. But the resemblance ends here, because their understanding of the soul is so different. Descartes can simply say that it is the soul

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1/ Kahn, Charles, "Sensation and Consciousness in Aristotle's Psychology.

2/ See also Block, Irving, "The Order of Aristotle's Psychological Writings", Amer. Jour. of Philology, p. 82 (1961); Nuyens, Franciscus, J.C.J. L'Evolution de la Psychologie d'Aristote; and Jaeger, Werner W. Aristotle; Fundamentals of the History of his Development, Oxford, Clarendon, 1948.

which perceives and not the body.[3/] Aristotle, on the other hand could not oppose the two in such a simple fashion, since the two are, on his view, so interwoven as to form one thing.

At the beginning of Book II of the DA, Aristotle leads up to his definition of the soul in the following way. All particular things which we encounter daily through our senses are made up of both matter and form; matter which is merely the potency to become some particular thing, and form which makes it be this particular kind of thing rather than another kind of thing. Some bodies are natural, having the principle of their own motions (broadly construed to include all changes) within themselves, while others are artificial -- i.e. man-made. Among natural bodies we must further distinguish between those which possess life (as manifested by nourishment, growth and decay) and those which do not (for example, stones). The term "soul" is used only of those natural bodies which are capable of life.

Aristotle then goes on to define the soul as the "form" or "actuality" of the body (412a20-21, Smith trans.) or its "specifying principle" (Moerbecke trans.). It is "the primary act of a physical body capable of life" (412a 27-29, Moerbecke trans.), or the "first grade of actuality

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3/ Descartes, La Dioptrique, Disc. IV, p. 109 (AT VI).

of a natural body having life potentially in it" (Smith trans.). It is thus the soul which provides the actuality or the being-what-it-is[4/] of a natural body. Thus plants and animals have souls as well as persons. He also describes the soul as the "substantial" form of the body, as distinguished from an accidental form. An accidental form is one which, like the whiteness of a body, could change without the body ceasing to be what it is, but a substantial form is one which the body could not lose without ceasing to be what it is.

The soul, then, and the body of which it is the substantial form are inseparable, just as the wax and the impression made in it are one, or more generally as the matter of any thing and that of which it is the matter. It is especially important to realize, for the sake of contrast with Descartes, that Aristotle understands the soul to be the form or act of the body as a whole. The idea that the soul might be located exclusively at some one particular point in the body like the pineal gland is quite alien to the way Aristotle thinks. The closest he comes to that is the passage in De Juventute et Senectute (DJS) 460a16-18, where he says that the "principle of sensation" is located in the heart, but this seems to indicate only a

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4/ I borrow this term from Marjorie Grene, A Portrait of Aristotle, p. 80.

source or spring rather than the idea that the sensitive soul is located only here. In the DA passage we have been considering, he gives an interesting analogy which clearly relates the soul to the whole of the sensitive body. He says that if the eye were an animal, sight would be its soul, and that what holds of the part applies to the whole living body.

> for the relation of a part [of the soul] to part [of the body] corresponds to that of sensitivity as a whole to the whole of the sensitive body, considered as such." (412b 17-25)

Sensitivity, then, is understood to be the act of the whole sensitive body, and is not confined to the sense organ as it would be if the eye were (as it is not) an animal. It is the two together -- the body and the soul which go to make up the whole animal. Just as an eye without sight would be an eye only in name, so the living body is such only by virtue of the conjunction of soul and body, and it is this composite which senses.

Thus when Aristotle makes such a statement as that the soul is "that by which we primarily live and perceive and move and understand" (414a12-14), we must be careful not to think of him as opposing soul and body. Rather, what he means is that it is qua informed by the soul that the animal, plant or person lives, perceives, or whatever, but it is the composite which lives or perceives, etc. (The intellectual faculty in man is unique in its independence of

the body, but this lies outside of the scope of our inquiry here.)

Turning now more particularly to his discussion of sensation, let us look at how Aristotle's major metaphysical distinctions shape his understanding of perception.

B. Potentiality and Actuality in Sensation

The distinction between potentiality and actuality is crucial to Aristotle's understanding of sensation, and is the first thing which he clarifies in his discussion of sensation starting at 417a. It is particularly interesting to see how Aristotle, using this distinction, postulates a kind of close metaphysical interweaving of the perceiver and the object sensed, by contrast with the way in which the two become sharply separated and external to each other on Descartes' view. Aristotle looks at sensation within a context which includes both organism and environment, and observes that the senses are in themselves mere potency which requires the presence of their proper objects in order to become actualized, just as the combustible requires the presence of something from outside to make it burn. Otherwise, Aristotle reasons, we would be able to sense objects at will, which we cannot do.

Now, it is true that sensation occurs in the one who senses. As Aristotle says, "the action and the reception are in the recipient, not in the agent", and thus "the act of the sense object and of the sense faculty are in the

sensitive recipient." "The act of what moves or causes is realized in the recipient" (above quotes are from 426a). Notwithstanding this, however, Aristotle does not struggle with the problem which so plagued later philosophers of how we can get from something happening in us to the object "out there". And at least one reason for this, I suggest, lies in Aristotle's understanding of potentiality and actuality.

The sense faculty, being only potentially its objects, must be brought to actuality by the sense object acting on it. For example, the visual faculty, being only potentially colored, can only become actually colored through the action upon it of something actually colored. Being what it is, the sense faculty has the power to become its object in the sense that it is informed by the form of the object, and this actualization of the sense faculty is unintelligible without the action of the sense object. In fact, Aristotle goes so far as to say that

> "Since the act of the sense object and of the sense faculty is one and the same, (though each has its own being), it is necessary that they pass away or remain simultaneously. (426a15-20)

Thus, whenever we have actual sensation in the organism, we have the sense object acting <u>in</u> the organism, and, further, the very act by which the sense faculty which is potentially, say, colored, becomes actually informed with the form of a particular color <u>is</u> the act of the sense object

which is bringing this about. Thus the kind of inner dichotomy between act and object which has emerged in later philosophy of perception is avoided.

C. Matter and Form in Sensation

The distinction between matter and form, already touched on above, is absolutely essential to a proper understanding of Aristotle's theory of sensation. Sensation is an actualization of the potency of the sense faculty; it is at the same time a reception of form, for it is by receiving the form of the object that the sense passes from potentiality to actuality. "All sensation is the reception of forms without matter," (424a16-17) and it is this ability which distinguishes animals from plants. The plant assimilates things like water or nutrients, but in so doing it changes these and physically incorporates them. Animals, however, can sense objects without this sort of physical incorporation, as the mouse senses the cat without causing any change in the cat.

What, we might ask, is it which enables the sense faculty to receive forms without matter, while a plant cannot? Two factors must be noted: the physical constitution of the sense organ and the fact that it is part of a living being with a sensitive soul (a corpse may have the same physical constitution as a man, but cannot for that reason alone sense). These two things are not wholly independent. Just as certain bodies are, by their

constitution, fitted to receive certain sorts of soul (and thus reincarnation between animals and humans is impossible), so also the sense faculty can only exercise itself in a sense organ which has the sort of material composition which will enable it to perform its function. It is the sense faculty which receives the form of the object in sensation, and the sense faculty or power resides in the material organ but is not identical with it.

> What perceives is, of course, a spatial magnitude, but we must not admit that either the having the power to perceive or the sense itself is a magnitude; what they are is a certain ratio or power in a magnitude. (424a 25-28, Smith trans.)

Cherniss explains the point thus:

> The faculties of sense are not themselves material, but Aristotle is concerned not with the faculties alone but also with the material nature of the organs in which they arise, for the material of each organ is determined by its formal cause or function.[5/]

The material sense organ must fulfill several requirements if it is to successfully enable us to receive the forms of objects. First of all for those senses which involve an external medium -- vision, hearing and smell, the sense organ must be composed predominantly of that element which serves as the medium for that quality. Thus the

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5/ Cherniss, Harold, Aristotle's Criticism of Presocratic Philosophy, p. 316.

organ of hearing is composed of air since air is the medium of sound, and the eye is composed of water which (along with air) is one of the mediums through which color is conveyed. If the eye were composed of earth, for example, it could not receive the forms of color since it would lack the necessary translucency.

Secondly, the sense organ must be so constituted that it is a kind of mean between the extremes of each pair of contraries which it can discern. The sense of taste must be neither bitter nor sweet; the flesh must be neither too hot nor too cold, too hard or too soft. Sense, we are told (DA 426b8) is a ratio or "a 'proportion' which is hurt or destroyed by extremes", and this explains why excessive stimulation destroys it -- overly bright lights can blind or loud sounds deafen. What is essential is that the sense be in some way neutral with regard to the extremes of the qualities it discerns, and this can take the form of a complete absence of the quality it discerns (as the water in the eye is colorless, or the air in the ear is without sound), or it can take the form of having the quality, but being in the middle of the range between extremes. Thus the flesh cannot be either too hot or too cold, too hard or too soft. The reason touch is different is because there is no external medium -- the flesh itself is the medium --

and the flesh, being predomionantly made of earth, cannot be without some particular temperature, hardness, etc.

This understanding of the senses as a kind of ratio or mean flows from his view of sensation as the receiving of forms, although the connection is not obvious at once. What happens in sensation is that:

> The sensitive power is potentially that which the sense object is actually. It is acted upon insofar as it it not like; it becomes like, in being acted upon; and is then such as is the other. (418a2-6)

But if the sense already were just the same as its object it could not go through the process of becoming like it -- and it is this process which is sensation.

> For to perceive is to receive an impression. Hence whatever makes the organ to be such as itself is actually, does so, the organ being in potency thereto. Hence we do not perceive what has heat, or cold or hardness or softness to an exact similitude of our own heat, and so forth, but rather the extremes of these: the sense being, as it were, in a mean state between the contrary extremes in the objects perceived; which is how it discriminates between them.(423b32-424a5)

Sensation, then, is a physical process in which the material sense organ undergoes a change, and thus the physical constitution of the organ is important. But to look at this process exclusively on a physical level, supposing that sensation just <u>is</u> the eye becoming colored or the

flesh warm, would be to sell Aristotle short.[6] What was truly innovative in his theory of perception relative to his predecessors was the way in which, using the distinctions of form/matter and actuality/potentiality, he freed the theory of perception from the overly materialistic explanations of those who supposed, like Empedocles, that only like could know like (fire could know fire and water water, etc.), or the atomists who, like Democritus, reduced perception to a mechanically explainable impact of particles upon the sense organ, and eventually upon the soul (understood as a material thing).

Aristotle, by contrast, sees sensation as a reception of form which, in humans, already partakes of intelligence in that it involves a rudimentary level of abstraction and provides the basis for the higher intellectual functions.[7] Not even touch, which has the lowest power of abstracting form from matter, is adequately explained by a literal physical becoming what the object is, for although the flesh does become warmer when feeling a warm

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6/ Thomas Slakey, in a recent article in the Phil. Review (1961) called "Aristotle on Perception" offers this very interpretation. See, for example, pp. 470 and 474.

7/ Brian O'Neil, in an interesting paper entitled "Direct Realism and Sensory Abstraction," argues that the kind of abstraction which Aristotle postulates at the level of the senses is, in fact, very important in providing a basis for his epistemological realism.

object, our hand does not become rough or hard when feeling a hard, rough object. Thus, reception of the form of the object cannot mean merely the organ becoming literally as the object is.

Instead, we must realize that in a creature with a sensitive soul, the sense faculty or power is the form or act of the sense organ (although not in isolation from the common sense, as we shall see below). The action of the object in the sense organ stimulates the faculty into act in such a way that it takes on the form of the object. The two are then united in a common form, the faculty becoming conformed to the object, and it is this which is essential in explaining our knowledge of the object.

The epistemological appeal of this sort of theory is that it obviates the necessity for any sort of third entity of a representational sort in the perceptual process, since the faculty itself is informed with the form of the object. The doctrine is not, of course, without obscurity, and is especially hard for us to grasp since we live in an intellectual climate where Descartes has largely succeeded in his ambition to replace Aristotelean physics, which relied upon notions like "form" and "quality" with a purely quantitative and materialistic physics, and so these Aristotelean terms fall strangely on the modern ear. All the same, it is possible, I think, for us to see on a

general level at least, the role which the notion of form played in Aristotle's theory of sensation.

Summary

We have completed now our initial discussion of the basic metaphysical framework within which Aristotle approaches perception. Let us briefly summarize some of the things about this framework which prevent Aristotle from holding a representative theory of perception of the sort which Malebranche or Locke, for example, did.

1. His understanding of the soul as informing the whole body, or as being the act of the body, prevents him from any sort of separation in which the soul confronts the body, or any state of the body as an object. Rather, whatever affects the body thereby affects the soul since the soul is the form or act of the body.

2. The distinction between potentiality and actuality, when applied to perception, leads us to understand it as a close interweaving of perceiver and thing perceived. Sense, being in itself a mere potency with regard to its objects, can only be brought to actuality by the sense object acting in it. Thus wherever we have sensation we have the sense object acting in us, and we cannot separate the act of the object and the act of our sense faculty, these being postulated to be the same. The very understanding of what sensation is thus involves the object as well as the perceiver, and the identity between the act of the object

and the act of the sense faculty makes it impossible for Aristotle to see the relation between the mind and its ideas in terms of the sort of act/object model which Locke, for example, does.

3. The distinction between form and matter makes possible a unity between object and perceiver, in that the form of the object can exist also in the perceiver, although in a different way. The same form exists in the tree making it be a tree, and in the perceiver, enabling him to know the tree. The reception of forms by the sense faculty itself makes any sort of representative entity between perceiver and object unnecessary. No such "bridge" exists for the person who admits the existence only of physical atoms (like Democritus). These cannot serve the kind of function a "form" does, since the particles that make up the object and those which make up the sense organs remain external to each other.

Sense Objects: Proper, Common and Incidental:

There is one other distinction Aristotle makes which is especially important for his philosophy of perception and which, therefore, must be briefly discussed before we go into the specifics of vision. This is the distinction between proper, common and incidental sensible objects -- a topic which has received a great deal of attention from epistemologists and which has generated considerable disagreement. It is also an important area of contrast with

Descartes in that the latter, like Aristotle's opponent Democritus, attempted to reduce the proper sensibles to the common ones. The distinction between them is one of the touchstones of Aristotle's theory of perception.

The discussion of proper, common and incidental sensibles comes right at the beginning of his discussion of sensation. As soon as he has established that sensitivity is a kind of potency actualized from without, he begins briskly at 418a6 "In treating of each sense we must first discuss sense objects." The "essence" (Moerb. trans.) or "structure" (Smith trans.) of each sense is naturally adapted to its proper object (418a25-26). Thus the object is prior to and determines the faculty. Aristotle's approach here, then, differs very importantly from that of the critical philosophers like Locke or Kant who begin with an examination of our knowing faculty and its powers.

Sense objects, we are told, fall first into two broad categories: those which are "essentially" perceptible and those which are only "incidentally" perceptible. (418a7-9)[8/] The first category is then divided into the proper sensibles and the common sensibles.

8/ Smith translates the terms and as "directly" perceptible and "incidentally" perceptible, while Moerbecke uses the term "essentially" instead of directly. I shall use Moerbecke's term because it captures better the way in which Aristotle sees the proper and common sensibles as
(Continued next page)

Perhaps a good way to get a hold of what the essential sense objects are is to contrast them with the incidentally sensible objects. The example Aristotle gives of an incidental sensible is the son of Diares. It is as a colored (white) thing that he affects our sense of sight and not qua son of Diares. The contrast of this case with that of the proper sensibles is, thus, quite clear. Proper sensibles are those which fall under only one sense, and about which we can't be mistaken, or at least about which error is at a minimum [428b18]. It is the object's color which effects a change in the organ of sight, actualizing the potentiality of the visual faculty so that it becomes informed with, for example, the form of whiteness. The son of Diares does not, per se, produce any change in our sense faculty.

The nature of what Aristotle calls the sense objects in common is a bit more difficult to specify, and has caused controversy among commentators. At 418a17-18 he simply lists them: movement, rest, number, shape and dimension, (at 425a16 he adds unity), and then says that they are proper to no one sense but common to all, as movement is perceptible by both sight and touch. First, of

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8. (cont.) perceptible by their nature or through themselves (a literal rendering of the Greek). It also does not give rise to the implication that the incidental sensibles are seen only indirectly, and hence, are not really seen at all.

course, the things he lists are not all perceptible by, say, hearing, smell or taste, so we must interpret him to mean that they are common to at least two senses. And, secondly, just why these things are essentially perceptible and different from those things merely incidentally sensible requires a little clarification.

They differ from the proper sensibles in that the whole essence or nature of the sense, e.g. sight, is adapted to its proper object, color, so that it is actualized by receiving the forms of various colors. This way of putting the point is, of course, rather metaphysical. On a purely physical level, we could say that certain physical changes are being produced in the eye and nerves and brain (or heart) by the colors of the light striking the eye. These two levels of explanation are not, of course, mutually exclusive, but rather complementary ways of understanding what is what is going on. And what emerges on either account is that there is one aspect of reality to which each sense is sensitive, and thus these things have a special privileged status for that sense.

Why, then, since the common sense objects do not have this special privileged status with regard to any sense -- why are they not simply incidental sense objects like the son of Diares? The son of Diares is only incidentally perceptible because, as Aristotle says, the sense is unaffected by that object as such (418a24-5). That the sense

is affected by movement or shape is implied in this passage, since Aristotle is here distinguishing incidentally from essentially perceptible objects. As Da Corte puts it:[9/]

> ... it is precisely because the accidental sensible qua accidental in no way affects the sense that it is distinguished from the common sensible (my translation).

It is true that the sense is not affected in the same way it is affected by its proper object, but nonetheless it is affected differently by a large object than by a small object, or by a moving object than a stationary one, and thus the common sensibles do cause a difference in the reaction of the sense. In this they differ both from those incidental sensibles like the son of Diares, the perception of which involves the intellect, and from those incidental sensibles which do not-- like the perception of the sweetness of sugar by sight.

The common sensibles are thus perceived through the special senses, although in cooperation with the common sense, as we shall see below. They are not proper to any one sense, and there is no additional special faculty to which they are proper. They do not have a kind of direct line to the common sense; rather the common sense perceives them only because they are already perceived by a special

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9/ Da Corte, Marcel, "Notes Exegetiques Sur la Theorie Aristotelienne du Sensus Communis," p. 192.

sense. Their relation to the common sense will be discussed in detail below.

The common sensibles are important because they are the basis of all our quantitative knowledge of nature. The proper sensibles, however, are equally basic to Aristotle and colors, sounds, heat etc. are real features of the world just as much as size or motion. Aristotle, in his physics, makes extensive use of the principle of contrariety in explaining change.[10] The primary contraries hot-cold and moist-dry are especially important. It is, however, only the proper sensibles which display contrariety; each sense, as we saw above, discriminates within a range of species within a genus -- e.g. the colors ranging between white and black (the underlying contraries). The common sensibles like figure do not display contrariety.[11] It is thus important to Aristotle's physics that the distinction between proper and common sensibles be preserved; his physics and his psychology are closely intertwined.

10/ See Anton, John P. Aristotle's Theory of Contrariety for an interesting discussion of this.

11/ Interestingly, at De Sensu et Sensibili (DSS) 442 Aristotle gives several arguments for the irreducibility of savors to shapes and of proper sensibles in general to common sensi bles, one of which is that since the proper sensibles display contrariety while the commmon sensibles do not, therefore the former cannot be identified with the latter.

Descartes' psychology and his physics are likewise very closely related. It was his ambition to free physics from the substantial forms and real qualities of the Aristotelean tradition, replacing them with things like figure and motion which do not display contrariety and are amenable to being managed in a purely quantitative manner. It is thus, necessary that his account of perception, if it is to support and be consistent with his physics, eliminate the proper sensibles. This he does, by treating figure and motion as the objects of all the senses alike, as we shall see below.

II.

VISION

Having, now, laid some of the necessary groundwork, let us turn more specifically to his discussion of vision. Following this we will conclude with a brief discussion of the "common sense". It is, of course an artificial separation to treat the faculty of sight apart from the common sense, since in practice they work together so closely that vision could not occur without both of them functioning. However, since Aristotle himself treats them in this order in both the DA and the DSS, it seems that this is a safe path to follow, and one which will give us a clear grasp of the visual process as a whole.

Aristotle's theory of vision is limited in important ways by the lack of scientific information available to

him. Nonetheless, the way he uses the concepts we have been discussing above does make his theory importantly different from those of his prececessors, as well as from the mechanistic theory proposed by Descartes; from the particular details of his theory, underlying principles can be extracted.

One thing he shares with Descartes is that both of them see the medium as of crucial importance. Both of them reject the theories that objects send off little copies of themselves, or that the eye emits some sort of visual rays. For both of them our perception of light and color results from a kind of action of the intervening medium (air). Descartes, however, explains this action in mechanical terms, taking it to be analogous to the stick the blind man uses to feel his way, and relating colors to the spinning motion of particles. Aristotle's account of the medium of vision and its relation to light and color is totally different, involves, as we might expect, a more qualitative approach, and uses the potentiality/actuality and matter/form distinctions.

A. Light:

That of which there is sight is color and only color is essentially visible (418a26-34). However, colors can only be seen in the presence of light, and thus Aristotle begins his discussion with light and its relation to the medium (the diaphanous). There are in nature, Aristotle

says, some things which are transparent, and these are visible by virtue only of concomittant color (418a4-6) -- we do not see them, we see through them. Air, water, crystal, and various other things to a lesser extent share this common transparent (or translucent or diaphanous) nature. The transparent, however, can not always serve as a vehicle for color, but only when it is illumined by light. Light, Aristotle says, is:

> ... the act of this transparency, as such; but in potency this [transparency] is also darkness. (418b8)

He also says that:

> ... light is a kind of colour of the transparent, in so far as this is actualized by fire or something similar to the celestial body. (DSS 439a17-19)

Thus, Aristotle is freed from the idea that light is material. If it were material, he says, it couldn't be in the same place as the diaphanous medium, since two things cannot be in the same place at once. In seeing it as an act of the transparent medium, he is also freed from the notion that it travels necessarily in a sequential way through successive parts of space, arriving first at the midpoint between object and eye (as is true of sound and odor). Light, he says in DSS 447a, is not a local motion, but rather a qualitative change, and this sort of change can conceivably take place in a thing all at once, just as water may freeze simultaneously in all its parts. Even

though parts of water may freeze sequentially if it is a large body of water, the same is not true of light, as he states clearly at DSS 447a10. All parts of the medium are affected at once when it is in contact with fire or a celestial body. This is confirmed by his remarks in the Nichomachean Ethics 1174a15, and b12 to the effect that vision is perfect at any instant and involves no temporal process.

B. Color:

Once the diaphanous medium has become actualized by the presence of fire or the celestial body, (the necessary first step in the visual process) it is then capable of being further actualized or moved by the colors of objects in such a way that these colors are communicated to the eye. Aristotle's remarks in the DA on the subject of color are quite brief. It is of color that visibility is predicated essentially (418a30). It is able to move the already actualized transparent medium (419a12-15). Color, we are told:

> ... moves the transparent medium (say, air); and the sensitive organ is moved by this extended continuum.

The impression given is that color is in some sense a property of things overlying their surfaces, yet very little is said about what colors are in the object. Rather we are told how they affect the diaphanous medium and the sense organ.

In the DSS this gap is filled in to some extent, and colors in the objects themselves are connected with the existence of the translucent element in them.

> It is therefore the translucent, according to the degree to which it subsists in bodies (and it does so in all more or less), that causes them to partake of color. (DSS 439b 8-10)

and thus it must figure importantly in our definition of color:

> ... we may define color as the limit of the translucent in determinately bounded body. (DSS 439b12)
>
> ... color being actually either at the external limit, or being itself that limit in bodies. (DSS 439a30)

He then proceeds to draw a rather interesting connection between light and color. For:

> ... that which, when present in air produces light may be present also in the translucent which pervades determinate bodies; or again, it may not be present, but there may be a privation of it. Accordingly, as in the case of air the one condition is light, the other darkness, in the same way the colors white and black are generated in determinate bodies. (DSS 439b14-18)

The other colors, he believes, arise from a mixture of white and black, (DSS 442a12-14) there being a finite number of species of colors (DSS 440b24-5).

The above account of light and color is far from crystal clear in that it is rather sketchy and relies upon analogies. However, a few major points do stand out:

1) Light, being a qualitative modification of the medium, travels instantaneously.

2) Color in objects exists actually at their surfaces, (although he says that it exists in potency in their interior), is a function of the translucent element in them, and has the power of actualizing the medium (which has already been actualized by light).

3) The way in which colors actualize the (already actualized) diaphanous medium must not be interpreted as a local motion, but rather as a qualitative change through which the forms of the colors are conveyed to the eye. It is for reasons like this that it became a commonplace among the scholastics that vision is the most spiritual of the senses, and this doctrine seems at least implicit in Aristotle who implies that vision has the highest power of receiving forms without matter.[12/]

C. The Eye

Having examined the action of the medium in vision, let us now turn to the function of the eye as Aristotle understood it. We already know that vision must be a process by which the visual faculty which is potentially its object becomes actually its object, and that this change is effected by its reception of the form of its

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12/ Beare, John I., Greek Theories of Elementary Cognition, p. 231.

object (without the matter). The details of the way in which Aristotle believed that this takes place are, of course, colored by, and limited by the physiological knowledge which was available to him.

At the time he wrote, the existence and functions of the retina were virtually unknown, the optic nerves were not really known, or at least not correctly understood. They knew of the existence of the lens, but knew nothing of its refractive powers or of the mechanism of accomodation. The pupil was generally thought to be central to the visual process, since the reflection in it had been noted. It was known that the eye contained water, and some (e.g. Empedocles) hypothesized also a sort of intraoccular fire to explain why we see light when the eye is struck.[13] Many people, among them Plato, hypothesized that the eye actually emitted a sort of visual fire which issued forth to coalesce with the daylight to form a continuous optical medium.

In opposition to many of his predecessors Aristotle believed the contents of the eye to consist only of water, denying the presence of any fire in it. Although he makes no mention of the retina, he did clearly reject the idea that the outer surface of the pupil is the main locus of vision. The eye was, he said, an offshoot of the brain.

13/ Beare, op. cit. pp. 9-10.

He saw, correctly, that the reflection seen in the pupil is merely a case of the sort of mirroring which occurs with very smooth objects in general, and does not explain how we see. Vision cannot be a mere mirroring of this sort, he argues, for not all surfaces which reflect images have the power of sight (DSS 438a9-14). The idea that we see by virtue of something issuing from the eye -- either fire or any other sort of emission is dismissed firmly at DSS 438a25 as an "irrational notion," thus emphasizing the purely receptive character of sensation.

If we try to pin down what part of the eye is receptive of color, we find that the major part is played by the fluid in the eye which possesses the diaphanous nature as the air does, and thus forms a continuous optical medium with it. It is, itself, colorless, and thus when the diaphanous is actualized by light it has the further potential to receive the forms of the various colors. It is then able to serve as a kind of "inner lamp" (DSS 438b15), which is necessary, he says, because "the soul or its perceptive part is not situated at the external surface of the eye, but somewhere within."

III.

THE COMMON SENSE AND THE DEEPER PROCESSES OF VISION

Vision, however, does not end with the diaphanous element in the eye receiving the forms of colors. All the evidence -- philosophical, psychological and

physiological -- available to Aristotle points to the existence of some sort of unifying inner faculty of sense. Volumes have been written on the subject of this "common sense" in Aristotle, and one reason for this is that the doctrine is rather incompletely worked out in his writings. What we find is less a fully articulated theory than a variety of considerations which point to the necessity of some such central, coordinating sense. All the reasons given for its existence are, I believe, essentially consistent, and indeed complement each other, but the account of just what the common sense is is sketchy and at times seems inconsistent.

Our discussion here must be rather brief, but our interest in the emergence of idealism in the theory of vision necessitates at least some consideration of the common sense; the common sense is necessarily involved in our perception of number, size, shape, motion, etc., and although Aristotle does not explicitly discuss spatial perception, it would seem that this, too, would involve the common sense. Since a large part of Berkeley's strategy involved sharply separating these "common sensibles" from the proper sensibles, and in fact denying that we <u>see</u> them at all, it is necessary to see how the two were integrated in the Aristotelean framework -- at least in principle (even if the details were not fully worked out).

Our discussion will have three parts: 1) reasons Aristotle gives for believing in the existence of the common sense, 2) his physiology and the location of the common sense, and 3) the common sense and its relation to the special senses.

A. Evidence for the Existence of the Common Sense:

1. De Anima:

The most important argument Aristotle gives, and the one which he takes to conclusively establish that there must be a common sense, is that of 426b16-28. He argues, here, in essence, that the common sense must be postulated to explain our ability to discriminate between the objects of the special senses -- for example between white and sweet. There must, he argues, be one unified power judging that these are different, for otherwise it would be like one person perceiving white and another sweet. It must be a sense faculty since white and sweet are sensible qualities, but it cannot be either sight or taste since sight cannot perceive sweet or taste white. Thus there must be a sense faculty over and above the five special senses.

The only other mention of the common sense in the DA is at 425a where, in the context of arguing that there are only five senses, he remarks that there is no sense proper to the common qualities (425a14-16), but that "we have a general sense for common qualities" (425a27-29). A reason why the common sense must be involved in our perception of

the common sensibles can be inferred from this passage. He states that "we know all these [common qualities] by motion", and motion, like the other common sensibles is not proper to any special sense (for if it were, it would be only incidentally perceptible by the others -- a position Aristotle denies) (425a16-27). If motion is perceived by the common sense, then, so also are the other common sensibles which are known by motion.

2. Parva Naturalia Treatises

It is in these short, psycho-physiological treatises that Aristotle gives us the fullest account of the functions of the common sense. The purpose of these discussions is not so much to prove that there is a common sense, but to explain the phenomena of sleep, dreaming, memory, etc., and the common sense (already assumed to exist) is brought in to facilitate these explanations. To the extent, then, that the hypothesis that there is a common sense enables us to explain various phenomena which could not be explained by reference only to the special senses, this can be regarded as evidence for believing that there is a common sense.

Sleep:

In the De Somno et Vigilia (DSV), Aristotle asks why it is that when we sleep, all the senses become inactive at the same time. This is most reasonably explained, he argues, by supposing that sleep is an affection of the

central and "controlling sensory faculty" (455a20) "to which all the others are tributary" (455a35). When it becomes inactive all the special senses must also, but one of them can become powerless without affecting the controlling organ or faculty (the faculty being the act or form of the organ).

Self-consciousness:

In the same passage of the DSV, the existence of a common sense power is used also to explain our ability to perceive that we see or hear, "for assuredly, it is not by the special sense of sight that one sees that he sees..." (455a16-19). This appears to conflict with DA 425b11-25 where he says that in a sense we perceive that we see by the faculty of sight, but I believe this conflict can be resolved by saying that we perceive that we see by sight but necessarily in cooperation with the common sense. Both must be involved to have the experience of perceiving that we are seeing. This is borne out by the passage immediately following 455a16, where he says "it is not by mere taste, or sight, or both together that one discerns... that sweet things are different from white things" (455a18-19 emphasis added). So also it is not by sight alone that we perceive that we see.

Dreaming:

The phenomenon of dreaming, and especially our sometimes being deceived by our dreams, is also most reasonably

explained, he argues, on the hypothesis that the controlling sense faculty, which normally would correct errors by comparing testimony of several senses, is inactive, and hence we are taken in by the residual sense impressions which remain after the object is no longer presented to our senses. (De Somnis Ch. III, especially 461b3-8 and 25-30).

Memory:

His explanation of memory also necessarily involves the common sense, since it is only by this primary faculty of sense perception that we cognize time, and the perception of time is a necessary component of memory. (De Memoria et Reminiscentia 450a8-15)

B. Physiology and the Location of the Common Sense

The central argument from the DA discussed above presents the common sense as, above all, that faculty which brings unity and integration to the perceptions of the several special senses. It is, thus, of interest that Aristotle goes out of his way to discover, and to postulate when he cannot discover, a physiological unification of the senses in the region of the heart. This unity on the physiological level can be seen as a basis for the unity on a functional level; since the soul is the act or form of the body, it relies for its ability to function upon the unity and interconnectedness of the body (De Partibus Animalium (DPA) 667b21-31)

Looking more specifically at vision, we find Aristotle observing that a wound which severs the passages leading inward from the eye causes blindness, (DSS 438b10-15) and this in itself shows us that something more must be involved in vision than just the diaphanous element in the eye taking on the forms of the colors. Just which passages are severed and where they lead is not specified in this passage, but other works make it clear that he believes that the passages of all the sense organs run to the heart (De Generatione Animalium (DGA) 781a21-23) and that "because taste and touch can clearly be seen to extend to the heart, hence the others also must lead to it." (DJS 469a 10-14). Finally at DPA 656b16-19 he explains that there are channels which lead from the eyes to the blood vessels which surround the brain, and in De. Gen. An. 744a he explains that these blood vessels run from the brain to the heart. The heart is selected, by Aristotle, as the center for sensation for a variety of reasons, many of which rely upon physiological misinformation.[14/]

The selection of the heart as the center for sensation is bound up also with the idea that it is via the blood vessels that the impressions or movements from the sense organs are conveyed to the heart, although Aristotle seems to believe it is the "innate spiritus" or "vital air" which

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14/ Beare, op. cit. p. 330-331.

circulates with the blood which plays the main role in this transmission of impressions (DGA 744a2-4). The nature of this remains, however, somewhat obscure.[15]

Given, then, the unification of the senses in the region of the heart, are we to identify the heart as the organ of the common sense as the eye is of sight? Although many critics interpret him this way, the point is certainly not undisputed. Da Corte and Randall, for example, both deny that the common sense has an organ at all.[16] Aristotle does state that the controlling sense faculty is most closely associated with the organ of touch, all the other senses being dependent upon touch (De Somnis 455a 22-25), and at DSS 439a2-4 he says that the organ of touch is "closely related to the heart." These statements clearly do fall short of identifying the heart as the organ of the common sense, although it is at least in the region of the heart that the impressions from the various senses are unified, and this unification is a necessary condition for the operation of the common sense.

C. The Common Sense in Relation to the Special Senses

The central problem with explaining the common sense, as Aristotle sees it, is how to reconcile its unity with

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15/ See footnote 1 to the text just cited, comment by the translator, Platt. De Generatione Animalium, Oxford, Clarendon Press, in Works of Aristotle, ed. Smith and Ross, 1912.

16/ See Da Corte, op. cit. p. 204, and Randall, Aristotle, p. 88.

the fact that it can perceive numerically different and even contrary objects. He struggles with this problem at DA 427a and again in DSS Ch. VII. His solution on a general level is that there is:

> some one faculty in the soul with which the latter perceives all its percepts, though it perceives each different genus of sensibles through a different organ (DSS 449a7-10).

and thus,

> the controlling faculty is one, although differing as a faculty of perception in relation to each genus of sensibles. (455a 21-23 De Somno)

This, too, explains how we can perceive coinstantaneously different objects:

> "one can perceive [numerically different objects] coinstantaneously with a faculty which is numerically one and the same, but not the same in its relationship. DSS 449a18-22.

In trying to explain how this can be, he falls back upon a mathematical analogy: the common sense is one, yet also not one, just as a point on a line can be taken as one in itself, or as two in that it is the end of one segment and the beginning of another, so the same point is used twice (427a10-14). So also the common sense is one in itself, but as the root or source of each of the senses it is many; "it must lose its unity by being put into activity" (DA 427a6-7).

Ross in his commentary describes the relationship between the common sense and the special senses as follows:[17]

> We must think of sense as a single faculty which for certain purposes is specified into the five senses, but discharges certain functions in virtue of its generic nature.

One of the things which has troubled some commentators is the question of the relative autonomy of the special senses. Some hold that perception, at least of the proper sensibles, is complete in the sense organ, while others hold that the common sense is required even for the sense to discriminate between its own proper objects (e.g. black and white).[18] Athough Aristotle nowhere neatly separates the functions of the special senses from those of the common sense, certain things can be inferred from what he does say. Since he gives very detailed descriptions of

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17/ Ross, Sir David, (ed.) Aristotle's De Anima, p. 33.

18/ Slakey, for example, treats perception as a bodily event, localized in the sense organ. Block likewise suppposes that in the DA Aristotle held that the special senses "accomplish all the phenomena of elementary perception and selfawaremess". Beare also emphasizes the autonomy of the special senses (pp. 326-7). Kahn, by contrast, emphasizes the involvement of the common sense, which he regards as "neither more nor less than the sense faculty conceived as a single whole" in all perception. So does Rodier, whom Kahn cites on pages 56 and 57. (Rodier, Aristotle's Traite de l'Ame, Paris, 1900, Vol. II, p. 266). Ross in Aristotle acknowledges that the sense faculty is "a single faculty which for certain purposes is specified into the five senses" (p. 140) and thus that the common sense is involved even in the perception of the proper sensibles.

the capabilities of each of the five senses, it seems not unreasonable to assume that all those things whose perception has not been thus explained must involve the cooperation of the common sense. And secondly, to the extent that "discriminating" between black and white (for example) involves the consciousness that I am seeing the difference between them, it would involve the common sense.

Indeed, if we take seriously the model of the relation between the commmon and special senses quoted above, the very attempt to sharply separate the functions of the two would be misguided. If the special senses merely <u>are</u> the general sense faculty exercising itself through the particular sense organ, then such separation would be impossible in principle. We could, perhaps, say that it is the eye which contributes that which is essentially "visual" about our visual experience, or to put it in more Aristotelean terms, that it is the constitution of the eye -- its potential for being actualized by the forms of colors -- which enables our sense faculty to discern the colors of objects around us. But it is also the eye in conjunction with the organ of touch and the common sense which enables us to discern their shape; in fact Aristotle suggests that the reason why we have several senses instead of only one is so that we can discern the common sensibles. (425b5-10).

To see Aristotle in the right perspective we need to keep in mind the importance of the soul as the act of being

of the animal (or person), and, hence, as that from which all its powers (nutritive, sensitive, intellectual) flow; sensation is something the animal as a whole does. It is not a sort of assembly-line process in which the eye does one thing and then hands the product along to the common sense which does another thing and passes it on to the intellect. Conceptually, doubtless, such stages can be distinguished, and there may even be a slight temporal lag between the stimulation of the eye and the communication of the impressions to the region of the heart (although Aristotle is not explicit about this, and may believe that since perception is a qualitative change[19] that it occurs instantaneously), but we must not allow this to obscure the basic unity of the whole process. A contemporary psychologist J. J. Gibson speaks of "the nervous system, including the brain, resonating to information"[20] or the perceptual system being "tuned" to invarient information in the environment.[21] Although this language is metaphorical, it seems to capture fairly well the way in which Aristotle views the perceptual process as

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19/ De Somnis 459b.

20/ J. J. Gibson, The Senses Considered as Perceptual Systems, pp. 267, 271.

21/ Gibson, op. cit., p. 271.

both active and passive, and above all, as the act of the whole animal or person.

Summary

Having now finished our discussion of the common sense, let us briefly summarize the most important points.

1) The perceptual abilities we do have, self consciousness, as well as other phenomena like sleep, dreaming, memory, etc., all point to the necessity for some one central, coordinating faculty of perception.

2) The physiological evidence also points to a unification of the channels from the various senses in (Aristotle thought) the region of the heart. This unity on the physiological level can be seen as a necessary condition for the functional unity of the senses.

3) The relation between the common sense, or central or controlling faculty of sense, and the special senses is so close that it is impossible to sharply separate them. We must be careful, especially, not to fall into the temptation of supposing that the special senses perceive the proper sensibles and the common sense perceives the common sensibles. This would result in making the common sensibles proper to the common sense and thus only incidentally perceptible by the special senses (as sight might perceive the sweetness of sugar) -- a position Aristotle explicitly denies. Instead, we must realize that the

faculty of sense is essentially one and functions as a unit in perception.

IV.

CONCLUSION

We have now finished our discussion of Aristotle's theory of visual perception. As we have seen, there are many features of his approach to perception which differ significantly from that of Descartes. Given our interest in the rise of idealism, I have attempted to emphasize those aspects of his theory which are especially important for contrast with Descartes, and which are important in providing the basis for Aristotle's realism.

In the first part of this chapter we examined the metaphysical framework within which Aristotle explains perception. It was argued that the basic metaphysical concepts he employs, matter and form, act and potency and his understanding of the relationship between soul and body, enable him to provide an account of perception which does not involve the kind of sharp separation between the perceiver and the object which we find in Descartes and his successors. This makes it possible for him also to avoid postulating any sort of third entity to mediate between the two, as ideas came increasingly to do within the Cartesian tradition (as we shall see below).

In the course of our examination of the specifics of vision in Part II we found that Aristotle insists very

strongly upon the reality of the qualitative aspects of nature such as colors. Light is characterized as a qualitative alteration of the diaphanous medium, and colors are conveyed to the perceiver by means of yet another qualitative modification. And the processes which occur within the perceiver beginning with the eye are also described in terms of the sense faculty being brought from potency to act by the action of the object in such a way that it takes on the form or quality of the object -- colors in the case of vision.

This is in sharp contrast to Descartes, who approaches both the objects of sight and the processes occurring within the perceiver in a purely quantitative way. His explanation is cast wholly in terms of particles of matter and their local motion which can be specified mechanically.

The mechanization of the objects of sight brought about by Descartes led, as we shall see in Chapter III, towards the very un-Aristotelean view that light and colors have no reality outside our own minds. Colors, and indeed all the qualitative aspects of reality, came to be no longer seen as irreducible features of objects -- as really "out there" as they were on Aristotle's view. The mechanization of the processes of vision within the perceiver also had far-reaching consequences, as we shall see in Chapters II and IV below. When the function of the senses is understood in purely mechanical terms, this destroys the

basis for the theory of abstraction which was so central to Aristotle's epistemology, since the senses, on Aristotle's view, performed a very rudimentary sort of abstraction in receiving the form of the object without its matter.

And, finally, in the preceding section, we have considered the role of the common sense in Aristotle's theory of perception. This, too, is very important for contrast with Descartes.

One of the most important developments in the theory of vision between Descartes and Berkeley, which contributed to the rise of an idealistic understanding of vision, was the increasingly sharp distinction between what vision gives us (what we, strictly speaking, "see") and the contribution of the mind (or judgment). What we "see," then, was defined increasingly narrowly to include only what Aristotle called the proper sensibles (color, or perhaps light and color) and all the other senses were treated in a similar manner. By the time we get to Berkeley, the common sensibles have essentially vanished, leaving only the proper and incidental sensibles. Thus shape, being a tangible quality, is only incidentally perceived by sight -- just as the sweetness of sugar might be. And once such a restrictive definition of what we "see" has been accepted, the common sense conviction that vision gives us access to physical objects (i.e. that we see physical objects) is much harder (if not impossible) to defend. The senses

begin to be seen as several completely separate channels which yield us different sorts of what the sense datum theorist might call "raw feels," which must then be somehow integrated by the mind to form a coherent whole.

Aristotle's framework differs from this model in several important ways. First of all, the common sense, can be seen as a kind of bridge between the mind and the senses. It performs many of the kinds of functions which Descartes, Berkeley, and others attributed to the mind. It integrates the special senses, accounts for at least a certain level of self consciousness, checks the reports of the various senses against each other, corrects one by the other, etc. The sense faculty is a function of, and flows from the soul, which is the source of its powers, and there is, thus, a kind of continuum between the higher powers of the soul and its nutritive and sensitive powers (the lower being imbedded in the higher). Aristotle, therefore, since he does not sharply separate the mind and the senses, would not draw as sharp a distinction between "seeing" and "judging" as the post-Cartesians do.

Secondly, the common sense enables Aristotle to explain our perception of the common sensibles, and to explain it as a function of our sense faculty rather than something our mind does. The central or controlling sense faculty perceives the common sensibles <u>through</u> the several special senses. Our sense fields are thus integrated, and

the structural and quantitative features of our world are just as much perceived by our sense faculty as the qualitative features like colors or sounds. We do see the shapes of objects -- the same shapes we feel, and it is the common sense which enables us to discriminate the size, shape, number, motion, etc. of what we see.

The unity of the common sense and its differentiation in relation to the objects of the special senses is like the unity of the object, which remains one, although having a multiplicity of qualities (DSS 449a13-22). It is this unification of all the senses in one central and controlling sense faculty which enables us to discern the unity of the object sensed through several senses.

We have completed, now, our survey of Aristotle, whose work so deeply shaped western philosophy prior to Descartes. Descartes' philosophical system constitutes a very radical break with the Aristotelean tradition. Having been educated in scholastic philosophy, however, some elements of this persisted in his own philosophy -- particularly in his earlier works. In the next chapter we will explore both his continuity with, and his radical break from the Aristotlean tradition.

CHAPTER II

DESCARTES' BREAK WITH THE ARISTOTELEAN TRADITION

Having now examined the Aristotelean approach to perception and to vision in particular, our interest in the rise of idealism in the theory of vision necessitates a careful consideration of the changes made by Descartes, since these opened the way for a kind of idealism which would have been unthinkable in the Aristotelean framework. While Chapters III and IV will concentrate on Descartes' explanation of vision in the Dioptrics, much of which is of a rather technical and scientific nature, the purpose of this chapter will be to provide a more general and philosophical understanding of Descartes' relation to his scholastic predecessors, and of why perception was particularly important to him in his struggle against the Aristoteleans. This will put us in a position to appreciate what was truly novel in his approach to perception -- the way in which he redefined the problem of perception.

The first part of this chapter will deal in a general way with the evolution of Descartes' thought and the way in which his goals and ambitions brought him into conflict with the Aristotelean tradition. Special attention will be paid to the importance of Descartes' physics to him throughout his life and the extent to which his aspirations

in this area contributed to his vehement rejection of the scholastic tradition.

The second part will examine more specifically Descartes' relation to the scholastic theory of perception. Our main focus will be on the account of perception in Rule XII since the Rules are often seen as the most scholastic of Descartes' works, and thus serve well to illustrate the way in which he modifies the traditional theory. Here it will be argued that although he carries over certain features of the earlier system into his own, and intends to preserve an epistemological realism like theirs, the changes he has made in the basic Aristotelean metaphysical assumptions make it impossible for the system to continue to work in the way it did, thus necessitating a complete rethinking of the problem of perception.

In the concluding section it will be argued that perception is of particular importance to him in his struggle against the Aristoteleans since it is specifically perception which gives us access to the qualitative aspects of the world such as colors, sounds, tastes, etc. -- the "real qualities" which his metaphysics excludes. How, then, are we to explain our perception of them, relying only on extension and motion? The Dioptrics was intended as a sort of showpiece of how this can be done, and is thus of special importance to him.

PART I

THE EVOLUTION OF DESCARTES' THOUGHT: GOALS AND AMBITIONS

In order to understand why Descartes was so discontent with the Aristotelean-Thomistic framework he inherited from the scholastics, and what he thought his new system would provide which his predecessors could not, it will be helpful to begin with the years 1618-1619. Several things happened during these years just after his departure from La Fleche in 1615[1] which were influential upon the direction of his philosophy as a whole.

A. Descartes Early Conception of His Vocation

1. Friendship with Beeckman

On November 10, 1618, Descartes encountered Isaac Beeckman; the two felt themselves to be kindred spirits and became close friends at once. Beeckman was an enthusiastic supporter of the new mechanistic, corpuscular philosophy. His theories concerning the "matiere subtile" and the cosmic vortices doubtless influenced Descartes' physics.[2] But what is of most interest for our purposes here is the way in which the two men identified themselves and each

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1/ Sirven, Les Annés d'Apprentissage de Descartes, p. 45

2/ An insightful discussion of the importance of his relationship with Beeckman is found in Mary Novitsky's The Empiricism of Descartes' Method. On vortices and the "matiere subtile" see p. 13. On his relationship with Beeckman, see also, Milhaud, Descartes Savant, pp. 25-46, and Norman Kemp Smith, New Studies in the Philosophy of Descartes, pp. 12-14.

other as physico-mathematicians (an interest which they did not find shared by other people to the same degree), and the way in which Descartes speaks of Beeckman as a very important influence upon the direction of his vocation.

In an entry in his Journal headed "Physico-mathematicians exceedingly few" Beeckman writes:

> My Poitouvan [Descartes]... says that apart from me, he has never encountered anyone who united physics and mathematics so closely in his studies... I, for my part, have not spoken to anyone but him of this genre of studies. [AT X p. 52]

In a letter to May 6, 1619, he writes to Descartes:

> ... think of composing my mechanics and yours, ... do not fail to visit any scientist in order that nothing of what is good in Europe escape you, or rather so that you may explain your system to the other scientists. [Journal of Beeckman Vol. IV, quoted in AT X, pp. 168-9]

The two, thus, apparently intended to work together on a book on mechanics. Throughout their friendship, Beeckman posed Descartes numerous problems relating to such things as falling bodies, musical theory, the pressure of liquids in vessels, etc. and Descartes developed solutions.[3/] He encouraged the young Descartes to write; in 1619 we find

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3/ Milhaud, Descartes Savant, pp. 25-46, Beck The Method of Descartes, pp. 12-12. See AT X 54-78

Descartes referring in a letter to Beeckman to "the books that I intend to write at your instigation."[4/]

In the same letter, Descartes says

> I would forget the Muses rather than I would forget you, because they unite me to you by the ties of eternal affection. [AT X, p. 153]

Descartes also writes the following very significant lines to Beeckman:

> I promise you soon to undertake the editing of my Mechanics or of my Geometry and of celebrating you as the inspirer and spiritual father of my studies... You alone, truly, have awakened me from my idleness; you have evoked in me a science almost effaced from memory and you have led towards serious and better occupations a mind which had strayed from them. (AT X 162-163, Novitsky p. 19 translation)

What emerges, then, from an examination of his relationship with Beeckman at this point in his life is that Descartes was extremely enthused by the possibilities opened up to him by the new mathematical physics, regarded himself primarily as a scientist, and saw Beeckman as an important source of inspiration and guidance. Since Beeckman was a proponent of the new mechanistic, corpuscular philosophy, we have reason to suppose that Descartes found this congenial; and thus, even during this early period of his life, had already moved away from the physical theories of Aristotle.

4/ AT X p. 151.

2. Dream of 1619

Exactly one year after his meeting with Beeckman, Descartes had a dream which was very influential upon the direction of his vocation, in that it generated in him a sense that he, personally, had been given a special mission to be the founder of an "admirable science", which would unify all the sciences in a new way. Considerable attention has been given by scholars to this dream and its interpretation.[5/] A short work, "Olympica" which discussed this dream has been lost, but we have an account of it which is generally accepted as reliable[6/] in Baillet's La Vie de M. Des-Cartes (1691).

The details of the dream need not concern us here. We can also bypass those issues in dispute among scholars,[7/] and focus instead on those facts about the dream which are important and generally accepted. Descartes, himself,

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5/ See, for example, Milhaud, op. cit., pp. 47-63, Maritain The Dream of Descartes; Maxine Leroy, Descartes: Le Philosophe au Masque, Vol. 1; Sirven, op. cit., Chapter III, and Smith, op. cit., pp. 33-39.

6/ Smith, op. cit., p. 33.

7/ For example such issues as the extent to which he was involved with the Rosicrucians (a mystical sect) at the time of the dream and the influence this may have had, [Maritain discusses this extensively in The Dream of Descartes] or just precisely what was given to him in the dream as opposed to those things which he had already discovered in the several days of "enthusiasm" preceding the dream, or even the exact nature of the "mirabilis scientiae" -- issues which are all open to some question.

regarded the dream as having a divine origin, and his description of it involves the spirit of God, an evil genius and finally interprets the loud sound and bright sparks he experienced as the "Spirit of Truth" descending to take possession of him. He regarded the dream at the time as the most important thing in his life and vowed to make a pilgrimage to Lorette in thanksgiving for it. The spirit of truth was, he believed, by this dream "opening to him the treasure of all the sciences" pointing the way to a unification of philosophy and wisdom; the two books handed him in the dream signified "all the sciences gathered together".[8/]

It is significant that Descartes' first references to the essential unity of all the sciences (an idea so central to the Cartesian reform of philosophy) date from this period. Notes collected in the Cogitationes Privatae of 1619-1621 make reference to it[9/] and if we look at the account of his life given us in the Discourse we find that it is precisely to this winter of 1619-20 that he assigns his first meditations in which he reflected that greater perfection is to be found in works designed by one person than in those on which many have labored, and in which he

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8/ All quotes above are from Adrien Baillet "La Vie de Monsieur Des Cartes, reprinted in AT XII, pp. 179-188.

9/ AT X pp. 215, 255

resolved to clear away all his old beliefs and rebuild all in accord with reason. No longer is he simply a scientist using mathematical methods to solve problems in physics; his is the more exalted task of laying the foundations of a new universal science -- of sweeping away the past and making a wholly new beginning.

The dream of 1619, thus, besides revealing to him the underlying unity of the sciences, can be seen to account for another very important and persistent aspect of Descartes' thought -- namely his intense sense of mission and sweepingly broad ambitions. His first published work, the Discourse and Essays was to have been titled "Project for a Universal Science Destined to Raise our Nature to its Highest Degree of Perfection".[10/] In the introduction to the french edition of the Principles he says that although all previous philosophers had failed to advance us a single step in pursuit of wisdom[11/] his principles will enable us to arrive at "all the most exalted knowledge of which the human mind is capable".[12/] Indeed in the Principles he claims to have explained to us the manner "in which all the universe is composed".[13/] The projected fifth and

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10/ Maritain, The Dream of Descartes, p. 21.

11/ AT IX pt. 2, p. 8, HR Vol. I, p. 207.

12/ HR Vol. I, p. 209.

13/ HR Vol. I, p 212.

sixth parts dealing with plants, animals and man were never completed. However he has no doubts that his principles are adequate for explaining them, although, he says, several centuries may be required for actually deducing all the truths from his principles.[14/]

Although this unbounded confidence appears to us quite unfounded in light of the subsequent nearly total failure of Cartesian physics and some of the rather humbling discoveries of modern science, there is no doubt that his ambitious promises fired the imaginations of his contemporaries and attracted them to his philosophy. And the dream of 1619 was extremely important in giving him this sense of a special mission or mandate to reform philosophy as a whole.

Summary and Relation to Aristoteleanism

From this brief look at the events of 1618-1619, we can conclude then, that:

1) Insofar as Descartes identified himself as a physico-mathematician and accepted the sort of mechanistic, corpuscular philosophy of Beeckman, he had already parted company with scholastic philosophy, although traces of it linger in his thought much later. For an Aristotelean the mathematical qualities of an object (shape, number, size, etc.) were certainly aspects of the object, but they were

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14/ HR Vol I, p. 215

no more basic than other aspects, and certainly were not what was most basic for explaining, for example, how animals differ from plants or rocks, or indeed for explaining the acts of any substance.

As we saw in Chapter I, the great metaphysical distinctions between form and matter, potentiality and actuality, were what separated Aristotle from his materialistic, atomistic predecessors like Democritus. Such distinctions, and indeed all the qualitative aspects of the world, not being formulable in mathematical terms, can have no place in physico-mathematics, which commits us to a purely quantitative approach to nature.

2) That the ambitions to rebuild philosophy inspired by his dream would lead him into conflict with the Aristotelean tradition is obvious enough. The old must be cleared away to make room for the new. Less obviously, but equally important in placing Descartes in opposition to the Aristoteleans, was his idea, at least partly inspired by his dream, that a common method was to be used in all the sciences in order to unify them. According to the Aristotelean-Scholastic way of understanding things, it was quite appropriate for the different sciences, since they deal with different objects, to employ methods suitable to the kind of thing being studied, so that biology for example will use concepts quite out of place in mineralogy. Also different degrees of certainty are attainable

in different areas of study.[15/] These differences must be swept away, however, if we are to unify all the sciences and have absolute certainty in all.

B. 1619-1633: The Widening Breach With Scholasticism

Setting out in the directions described in the preceding section, it is not surprising that Descartes' researches led him futher and further from the traditional Aristotelean-Scholastic framework, and indeed, led him finally to total rejection of it. Regarding himself as too young still to begin the work of rebuilding human knowledge on surer foundations, Descartes spent the years from 1619-1628:

> ... preparing myself for the work by eradicating from my mind all the wrong opinions which I had up to this time accepted...

and:

> ... practicing myself in the solution of mathematical problems according to the Method, or in the solution of other problems which though pertaining to the other sciences, I was able to make almost similar to those of mathematics, by detaching them from all principles of other sciences... [HR Vol. I, p. 99]

The phrase "detaching them from all principles of other sciences" is, as Gilson points out, of great

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15/ Nich Eth. 1094b 22-28.

importance.[16] In seeking the method that is to unify the sciences it is to mathematics that he turns, and then it is upon the problems of the physical sciences and geometry that he uses it, giving us the Geometry, Meteors and Dioptrics as the first fruits of the new method. In dealing with these sciences he treats them all after the manner of mathematics, leaving aside the usual scholastic principles of explanation.[17] He does not try to criticize the scholastic notions; he merely sets them aside in practice. His important discoveries in algebra and analytic geometry doubtless strengthened his belief that he was on the right path and that the scholastic principles were unnecessary. His optical works were also highly regarded by his contemporaries, although the originality of much of his work is disputed among scholars.[18]

16/ Gilson, (ed.) Discours de la Methode: : Texte et Commentaire pp. 272-3, and Etudes sur le Role de la Pensee Medievale dans la Formation du Systeme Cartesien, p. 150.

17/ Gilson (ed.), Discours de la Methode: Texte et Commentaire, p. 272-3.

18/ Scott on p. 32 of The Scientific Work of Rene Descartes, says: "There are few marks of originality, and much that is in Descartes is to be found in earlier writers." Wallace cites and concurs with Scott and further provides a brief and very insightful discussion of the reasons for the sterility of Descartes' methodology in general. (The Scientific Methodology of Theodoric of Freibourg, pp. 257-263). For a discussion of the issue of the originality of his discovery of the law of refraction, see "Descartes et les Manuscrits de Snellius" by D. J. Kroteweg, pp. 489-501.

In his autobiographical account in the Discourse Descartes states that:

> These nine years thus passed away before I had taken any definite part in regard to the difficulties as to which the learned are in the habit of disputing, or had commenced to seek the foundation of any philosophy more certain than the vulgar. [HR Vol. I, p. 100]

Although we must be careful not to interpret this passage as indicating that Descartes gave no thought at all to metaphysics prior to 1629,[19] the evidence does indicate that he worked primarily on particular problems in mathematics and the physical sciences during this period without yet integrating them into a systematic whole or showing how they can be deduced from certain principles as he eventually hoped to do. The whole question of the relationship between his physics and his metaphysics (a question hotly debated by scholars) is made particularly difficult to resolve, because of the fact that in Descartes' time the two were not as sharply separated as they are now, the difference between them being thought to be only in their degree of abstraction.

By 1628, however, Descartes' opposition to the scholastic philosophy had crystalized to a point where,

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19/ Hamelin, at pp. 16-29 of Le Systeme de Descartes, gives a very careful and balanced discussion of the question of the priority of Descartes physics which shows one must be careful not to be overly simplistic about asserting the priority of either his physics or his metaphysics, since they are intertwined chronologically as well as logically.

during an important gathering at the home of the papal nuncio, he publicly declared that he had decided to "abandon the philosophy which is commonly taught in the schools, because he was persuaded by the reasons he had not to follow it", and intimated that he was certain it was possible to establish more clear and certain principles in philosophy and by their means to explain all the phenomena of nature.[20/] Cardinal Berulle, who was present, was so impressed by Descartes' arguments, that he laid it upon his conscience as a duty before God to work on developing his new philosophy. Descartes notes in the Discourse that by 1628 word had gotten out that he was in possession of a new philosophy, which was something of an embarrassment to him, since as yet he had sought no foundation for his philosophy other than the vulgar.

Accordingly, he went into retreat in Holland in 1629 in order to try to demonstrate metaphysical truths, a task he accomplished to his satisfaction.[21/] The Discourse part IV sketches the results of these metaphysical meditations. At the end of his retreat in October 1629 he announces "I have now taken a position regarding the foundations of philosophy."[22/]

20/ from Baillet, reprinted AT XII, p. 96.

21/ letter to Mersenne, AT I p. 144 1630.

22/ AT I, p. 25 to Mersenne.

Following this brief excursion into metaphysics, however, he plunges at once into work on his physics, (Le Monde), not intending to write anything on the results of his meditations until he sees how his physics will be received.[23] In Le Monde we find for the first time an open rejection and critique of a variety of scholastic concepts, including "real qualities" and "substantial forms". His ambition now is to explain "all the phenomena of nature, that is to say of physics".[24] The work is far more systematic than anything he had done to date; indeed he sees himself as finally embarking upon the work of reconstructing and systematizing our knowledge.

Le Monde was to provide an explanation of all natural phenomena without relying upon scholastic concepts. A letter to Mersenne of 1630 shows that he was working deliberately at giving mechanistic explanations of the qualitative aspects of the world (a problem, it may be noted, which he shared with such other proponents of the new mechanistic corpuscular philosophy as Galileo and Gassendi).[25]

> I thank you for the qualities which you have drawn from Aristotle; I have already another longer list, partly from Verulamio, partly from my head; and it is one of the first

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23/ AT I. p. 70.

24/ AT I. P. 144.

25/ See Dijksternhuis, The Mechanization of the World Picture, pp. 431-3.

> things that I shall try to explain. (AT I, p. 109)

His system, then, must be able to explain by extension and motion alone all the phenomena which Aristotle explained, and he is attempting to do just that in Le Monde.

However, in 1633 an event occurred which profoundly changed at least the public face of Cartesian philosophy if not its substance -- the condemnation of Galileo. He abruptly ceased work on his physics, deciding it would be unsafe to publish it under the circumstances. He did not, to be sure, abandon the substance of his physics; it appeared almost unchanged in the Principles. What happens, however, is that we find Descartes much more cautious about expressing openly the real nature and depth of his opposition to Aristotle.

Summary: 1619-1633

A brief simplified account of Descartes' development during this period would be that he first spent nine years on particular problems in mathematics and physics, merely setting aside scholastic principles. By 1928 he was convinced that he could do without them entirely; that they were obscure and without value in discovering truth. After a brief excursion into metaphysical issues like the existence of God and the soul (as really distinct from the body), he threw himself wholeheartedly into his physics again, this time with explicit criticisms of Aristotelean

principles and with the intent of providing a systematically developed alternative to the philosophy taught in the schools.

It is, then, a fact that a thorough and deliberate break with scholasticism took place during this period. Various reasons for this have been touched on above, and are summarized below:

1) On the most obvious level we can see that Descartes' desire to use a common method in all the sciences, and to treat all problems in the physical sciences in terms only of matter and motion so that they could be resolved by physico-mathematics, brought him necessarily into conflict with Aristoteleanism, since this latter rejected a purely quantitative approach to nature. This is why, as Gilson points out,[26] Descartes's proof of the real distinction of mind and body in 1629 was very important to him. Not only did it reassure him that his mechanistic approach to nature was consistent with the existence of God and the soul (something quite important if Descartes' philosophy was ever to gain public acceptance, and possibly important to him personally since he was a practicing Catholic); it also gave him a kind of license to treat nature in a materialistic and mechanistic fashion. Things were now very neat; there was extended matter and

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26/ Gilson, Etudes, p. 167.

there were minds, and these were totally different sorts of things. Gone were those mysterious in-between entities -- substantial forms, for which Descartes expressed "abhorrence".[27]

2) Certainly Descartes' success in explaining the phenomena of nature by means of his own method was a strong factor in his finally being ready to completely break with scholasticism. In a letter to Mersenne shortly after the publication of the Dioptrics he says:

> ... the second reason (which makes me reject these real qualities) is that the philosophers only supposed these real qualities because they believed they could not otherwise explain all the phenomena of nature; and I find on the contrary, that one can explain them better without them. (AT III, p. 649)

If he found the scholastics' principles obscure, their deductions fruitless in yielding new truths, and in addition was in possession of clearer and more fruitful principles by means of which he had already made important discoveries, then by all means why not get rid of the old Aristotelean physics?

3) A third reason for his break with scholasticism requires, perhaps, a little reading between the lines to

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27/ AT II p. 74. Although Descartes may well have misunderstood substantial forms, as Gilson argues (Etudes p. 162-3) it seems that given the whole thrust of his physics toward purely quantitative and mechanistic explanations, he would quite likely have rejected them even if he had understood them, at least if they were given any real explanatory role.

see, but is, I think, quite important. The Aristotelean tradition saw metaphysics as the crown of human knowledge, something to be reflected upon at length and sought for its own sake -- something superior to the purely practical arts. Descartes, by contrast, placed his emphasis upon our practical mastery of nature ("masters and possessors of nature")[28] and consequently upon physics which was to make this possible. Philosophy, as he explains in the introduction to the french edition of the Principles,[29] is thus like a tree whose roots are metaphysics, whose trunk is physics and whose branches are medicine, mechanics and morals. Just as trees are cultivated for the sake of their fruit, not their roots, so also metaphysics is of interest only as providing the foundation for physics which will yield us practical goods like medicine and mechanics.

Understanding this, then, we are able to explain the fact that in 1629, having assured himself that he could provide a metaphysical foundation, he plunged at once into the work of constructing his physics rather than working at refining and publishing his reflections on God, the soul, etc. It also explains the fact which he admits to Princess

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28/ Discours Pt. VI, HR Vol. I, p. 119.

29/ HR Vol. I, p. 211.

Elizabeth,[30] that he spent so little time on metaphysics in general. Mechanistic science seemed to him to promise the practical fruits he sought, and scholastic philosophy did not; it was thus inevitable that he would reject the traditional Aristotelean physics.

C. The Mature Descartes as Rival to Aristotle 1634-1650

In the years following the condemnation of Galileo, Descartes presents a rather enigmatic image. We have no reason to suppose he has abandoned his opposition to Aristotle, and indeed it is clear from many texts that he hoped his philosophy would replace that of Aristotle in the teaching of the schools. However, he can no longer bring Aristotle's principles into question directly, but must take a more indirect route. But that that is still his goal, and that even his philosophical works are designed to further this goal, is shown by an important letter to Mersenne in 1641 in which he says:

> ... between us I tell you that these six meditations contain all the foundations of my physics. But it is necessary not to say this, please, for those who favor Aristotle would, perhaps, make more difficulty about approving them; and I hope that those who read them will insensibly become accustomed to my principles and will recognize their truth before noticing that they destroy those of Aristotle. [AT III, pp. 297-8]

30/ AT III, p. 692-3. Also found in Anscombe and Geach, Philosophical Writings of Descartes, p. 280.

In the Principles, a work of his maturity, he often compares himself to Aristotle, as for example in Principle CCIV where he says that:

> That touching the things which our senses do not perceive, it is sufficient to explain what the possibilities are about the nature of their existence, though perhaps they are not what we describe them to be [and this is all that Aristotle has tried to do]. (emphasis added) [HR Vol. I, p. 300]

His opposition to Aristotle is more explicit in the preface to the French edition of the Principles of 1647 than in earlier published works due to the poor reception of the latin edition three years before. Descartes has largely despaired of a good reception for his philosophy by the Jesuits and writes in the vernacular for those unspoiled by the philosophy of the schools. He says:

> So when we have true principles in philosophy we cannot fail, by following them, occasionally to meet with other truths; and there is no way in which we can better prove the falsity of those of Aristotle than by pointing out that no progress has been attained by their means in all the centuries in which they have been followed. [HR Vol. I, p. 214]

The continued importance of his physics is also attested to by a remark in the preface to the french edition of the Principles where he speaks of the Discourse, Meteors, Geometry, Dioptrics and Meditations as all "preparing the mind of readers"[31/] to accept the Principles

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31/ HR I p. 212.

of Philosophy, the first part of which contains his metaphysics while the remaining three contain his physics. This confirms the point made in the letter to Mersenne just quoted, and can, I think, best be explained if we suppose (as discussed above) that the real distinction of mind and body, and the equating of the essence of physical things with mere extension, are the fruits of the Meditations which particularly help to prepare the reader's mind for Descartes' physics.

The reason why his intention to replace Aristotle's physics with his own must be kept a secret is, of course, that the Jesuits controlled the institutions of higher learning and were committed to the scholastic system. That their power was to be feared was brought home by the condemnation of Galileo, and resulted in some behavior on Descartes' part which it is hard not to see as duplicitous. In 1642 he writes Regius, a disciple, saying:

> Was it necessary for you to go ahead and reject so publicly the substantial forms and real qualities? Did you not remeber that I had declared in express terms in my Traité des Méteores that I did not discard them and that I did not claim to deny them, but only that they were not necessary to explain my thought and that I could make my reasons understood without them. [AT III, p. 492, translated by Maritain in Dream of Descartes, p. 42, emphasis added]

In 1645 he writes Clerselier, an influential Jesuit, speaking of how he "passionately" desires the friendship of the Jesuits since they have the power to impede his

philosophy from even getting a hearing or to bring about its success by supporting it. He then goes on to claim that his new philosophy can be taught in the schools "without contradicting the text of Aristotle".[32/]

He begins the Passions of the Soul, his last major work, again, with an attack on the "ancients". He complains here that they left us nothing of any value regarding the passions, so that he is obliged to write as though no one had ever touched on this topic before.[33/]

Thus, although Descartes believes Aristotle's principles to be false and fully intends to replace them with his own, he soft-peddles this fact for political reasons; thus the casual reader of his published writings can easily miss the sweepingness of his reforms of the Aristotelean system.

SUMMARY

We have now completed our sketch of the way in which Descartes' own goals and ambitions, and in particular his strong and persistent interest in mechanistic physics, led him gradually to a complete break with the Aristotelean tradition. His wholly quantitative approach to nature, his projected unification of all the sciences through a common method intended to produce absolute certainty, and his

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32/ AT III p. 157.

33/ HR Vol. I, p. 331.

preoccupation with the practical mastery of nature (which led him to treat metaphysics merely as a necessary foundation for physics) all led him away from the Aristotelean framework. In the process of moving away from it he discarded all those aspects of Aristotle's metaphysics which did not fit in with a wholly quantitative approach to nature: act and potency, forms, real qualities; and he developed a notion of the soul and its relation to the body which was deeply different from that of the Aristoteleans.

We will now examine the way in which these changes influenced his approach to perception, and generated a set of problems quite different from those which had arisen within the Aristotelean framework. Although the traditional system was not without problems, the kinds of problems arising as a result of Descartes' reforms were really quite new.

PART II

PERCEPTION IN THE RULES

The Rules, which was never published during Descartes' life time, and which was most probably written around 1628,[34] is a useful work for us to study at this point for several reasons. First, it contains his earliest attempt to produce a general philosophical account of perception rather than merely working on special problems of optics. Secondly, it preserves more traces of his scholastic training than the subsequent works on vision. And, thirdly, a careful examination of the text of Rule XII already reveals important divergences from the Aristotelean understanding of perception. These stem largely from his attempts to import into the scholastic framework a mechanism which is fundamentally alien to it. As a result some problems are generated which will continue to plague him in his later works on vision. The Rules, then, can be seen as a kind of meeting place of the old and the new, and therefore is a good introduction to Descartes' thought on perception.

One way in which he clearly wishes to place himself in the Aristotelean-Thomistic tradition is in his confident assumption that:

> In the matter of the cognition of facts two things alone have to be considered, ourselves

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34/ For this dating of the Rules, see AT X, p. 486-488.

> who know and the objects themselves which are known. [HR I p. 35]

That we know the world is, he thinks, obvious; the problem is only to explain the mechanics of how this happens. Accordingly, he proceeds to give us a brief sketch of the perceptual process, beginning with what happens in the sense organ. In the following we will examine this account carefully, noting both the similarities to the Aristotelean tradition and the differences from it.

A. The External Senses

Recalling for a moment the material presented in Chapter I, we note that Aristotle characterized sensation as the reception of forms without matter. Each external sense is in potency relative to its own proper object, and when stimulated by its proper object, it passes from potency to act in such a way that it becomes informed with the form of the object. Thus, although abstraction becomes perfect only on the level of the intellect, there is a sort of rudimentary abstraction taking place already on the level of the senses which receive the form of the sense object without its matter.

Descartes' account bears a superficial similarity to Aristotle's. He even uses the very example Aristotle used -- the comparison with the reception of a seal by a piece of wax. There are, however, several key differences.

1. The disappearance of the term "potency" and its replacement with "passivity".

Descartes begins his account by saying:

> ... all our external senses... perceive in virtue of passivity [passionem] alone, just in the way that wax receives an impression [figuram] from a seal." [HR I p. 36]

Although the difference seems small it is not insignificant. According to Aristotle the sense was in potency relative to its own proper objects only -- sight to colors, the tongue to savors, etc. The term "passivity" has no such connotations and signifies only the general state of being acted upon. Describing the sense organ as merely "passive" would also be misleading for Aristotle because when acted upon by its proper object the sense faculty goes from potency to act, the act of the sense faculty and that of the sense object being postulated to be one and the same. It is thus not wholly passive as a stone or a piece of wood would be.

2. The materialization of what occurs in the sense organ and the replacement of "form" with "figure".

Descartes' seemingly minor divergence from Aristotle here quickly becomes a yawning chasm, however, when we look at the way he interprets the wax and seal example. Aristotle used the example as an analogy only. At DA 424a17-24 he says:

> By a 'sense' is meant what has the power of receiving into itself the sensible forms of things without the matter. This must be

> conceived of as taking place in the way in which a piece of wax takes on the impress of a signet ring without the iron or gold; we say that what produces the impression is a signet of bronze or gold, but its particular metallic constitution makes no difference: in a similar way the sense is affected by what is colored or flavored or sounding, but it is indifferent what in each case the substance is; what alone matters is what quality it has... [J. A. Smith trans. emphasis in original]

Thus, when Aristotle speaks of the sense receiving into itself the sensible forms, he does not mean sensible shapes. The quality affecting the sense may be shape (figure), or it may equally well be a color, heat, or a sweet taste. Thus, the sense receives the form without the matter in a way merely analogous to the way the wax receives the shape of the ring. The "form" received by the sense is itself something immaterial, although it is not received in a purely immaterial way by the senses, as it will be by the intellect. A physical change does occur in the sense organ, but what is received is the form and not merely some physical material alteration.

Descartes, however, states:

> We ought to believe that the way is entirely the same in which the exterior figure of the sentient body is really modified by the object, as that in which the shape of the surface of the wax is altered by the seal. This has to be admitted not only in the case of figure, hardness, roughness, etc. of a body which we perceive by touch, but even when we are aware of heat, cold, and the like qualities. It is likewise with the other senses. The first opaque structure in the eye

> receives the figure impressed upon it by the light with its various colours; and the first membrane in the ears, the nose, and the tongue that resists the further passage of the object, thus also acquires a new figure from the sound, the odour, and the savour, as the case may be. [HR I p. 36-7]

Whereas for Aristotle the senses partake to some degree in the functions of intelligence, and indeed perform a sort of rudimentary level of abstraction, they can do no such thing if we accept Descartes' account here. The sense organs are directly mechanically acted upon by their objects (there can be no action at a distance for Descartes), and this results in certain changes in the figure or motion of the membranes of the sense organ. There is no essential difference from what happens to a piece of wax, except that the membranes in the sense organs are more fine and delicate so that they can be easily moved by the fine particles involved in the transmission of, say, light. What is received is no longer an immaterial form, but merely a physical alteration of figure or motion. This will turn out to have very far-reaching consequences for Descartes' theory of perception.

3. The tendency to reduce the proper sensibles to the common sensibles.

Although we do not find in the Rules the fully developed mechanistic account of the senses which emerges in l'Homme and La Dioptrique, where the operation of all the senses is explained only in terms of figure and motion,

we nonetheless find Descartes' thought clearly tending in the direction of treating figure and motion (which are common sensibles) as the objects of all the senses.

He is prudently cautious about denying the existence of proper sensibles, since the distinction between proper and common sensibles was so pivotal to the Aristotelean-Thomistic understanding of perception. However, it is hard to see how light and color could move the membrane in the eye in just the same way as the seal does the wax unless they were material in nature and possessed of some figure. Otherwise they could not act on the senses and hence would be unknowable. This reading is corroborated by the way he speaks of the membranes in the organs "resisting the further passage of the object" and in this way having their figure altered. Thus what is acting upon the sense is figure and motion; this would seem to imply that figure and motion are the proper object of <u>all</u> the senses alike. This view is more like that of Democritus than that of Aristotle.

That this is, in fact, the direction Descartes' thought is taking here is also corroborated by the fact that he, at this point, launches into an attempt to persuade the reader that the assumptions he is making are really quite harmless, do not deny accepted ideas about color, but are merely useful hypotheses, etc. These kinds of protestations are, I suggest, a fairly reliable indicator whenever they occur that Descartes is, in fact,

challenging some central Aristotelean tenet and is trying to soften the blow. In this light it is interesting that the whole discussion of the external senses was prefaced with a disclaimer that he is merely making assumptions as the geometers do, which we need not accept unless we like, and that in this section the passages in which he is trying to resassure his readers, etc., are of greater length than his actual discussion of the senses. Clearly, something important is at issue.

In his attempts to reassure the reader he says:

> It is exceedingly helpful to conceive all those matters thus, for nothing falls more readily under sense than figure, which can be touched and seen. Moreover that nothing false issues from this supposition more than from any other, is proved by the fact that the concept of figure is so common and simple that it is involved in every object of sense. Thus whatever you suppose colour to be, you cannot deny that it is extended and in consequence possessed of figure. Is there then any disadvantage, if, while taking care not to admit any new entity uselessly, or rashly to imagine that it exists, and not denying indeed the beliefs of others concerning colour, but merely abstracting from every other feature except that it possesses the nature of figure, we conceive the diversity existing between white, blue, and red, etc., as like the difference between the following similar figures? [appends drawings] [HR I p. 37]

An astute Aristotelean would not be taken in by this, however. For simply because objects which are colored also possess figure, this does nothing to show that color "possesses the nature of figure". It might be that he is

merely saying that the differences between colors are only analogous to the differences between various figures, but this seems less likely when we look at the concluding sentence of this paragraph (which also concludes the discussion of the external senses). He says:

> ... the same argument applies to all cases: for it is certain that the infinitude of figures suffices to express [exprimendus] all the differences in sensible things. [HR I p. 37]

The term "express" here is a rather vague and open-ended one. La Fleur translates it "explain,"[35] and indeed in his later works it is to figure and motion that Descartes turns to explain the operation of all our senses. The fact that Descartes does not mention motion here may or may not be significant. Certainly motion later plays an important role in his explanation of color. Apparently Descartes, still working with the more static wax and seal model, had not yet come to the thoroughgoing, consistent and sophisticated mechanism of Le Monde, L'Homme and La Dioptrique.

Be all this as it may, even the claim that all differences in sensible objects can be "expressed" by different figures would not be in harmony with the Aristotelean approach. Since tastes and colors are qualitatively different

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35/ L. J. La Fleur, Descartes' Rules for Direction of the Mind, p. 46.

sorts of things it would be hard to see how the difference between, say, sour and blue could conceivably be expressed as a difference between figures. Thus although he has held back from saying explicitly that there are no "real qualities" or proper sensibles out there, or that figure and motion are the proper objects of all the senses alike, that is clearly the direction he is moving in, and thus the distinction between proper and common sensibles is essentially discarded. His attempts to reassure the Aristoteleans on this point not only fail, but in fact strengthen one's suspicions that he does not believe in the existence of proper sensibles.

Summary: External Senses

Thus the changes in the Aristotelean/Thomistic way of explaining the function of the external senses are really quite far-reaching. The act-potency and matter/form distinctions are gone, with potency being replaced by passivity and form by figure. The distinction between proper and common sensibles is thrown into serious question, if not explicitly rejected, The function of the external senses has been reduced to a merely mechanical reception of certain changes of figure and motion (although the role of motion here is less fully elaborated than in his later works) which can then be mechanically transmitted inward to the imagination, common sense, etc. The external sense, thus, does not partake at all of the functions of

intelligence, even in the rudimentary sort of way it did for Aristotle.

B. Internal Senses: Common Sense, Imagination and Memory

For Descartes, as for Aristotle, more is involved in perception than the external sense alone; the common sense and the imagination are also necessary. Although his account of these in the Rules resembles the Aristotelean/Thomistic tradition in that the same steps are there in the same order (external sense, common sense, imagination, understanding), his mechanistic explanation of them, wedded as it is to the wax/seal model, differs from the traditional one no less radically than his account of the external senses did. The changes he has made lead, as we shall see below, to serious problems when he tries to connect the mechanistic process he has sketched with the understanding -- problems which he is unable to successfully resolve in the Rules. Indeed, it is not clear that he saw the seriousness of the problem at this point in his career.

Aristotle, as we saw in our discussion of the "common sense" in Chapter I, treats the sense faculty as a faculty of the sensitive soul, dependent upon the intactness and unity of the sensitive body for its ability to exercise its functions, but refrains from simply identifying it with some physical organ. The same is true of his treatment of the faculty of imagination which, while having a physical

basis in the movements conveyed inward from the senses, is nonetheless not merely reduced to some spatially localized body part. There is a continuity between sense and intellect; the lower faculties are permeated by the higher and flow into them.

Descartes' treatment of the internal senses differs from Aristotle's in several key respects. First of all, he materializes them, identifying each of them with a particular body part. Secondly, and relatedly, the figure impressed upon the external sense is conveyed via the common sense to the imagination by means of purely mechanical processes. The Aristotelean notions of matter and form, act and potency, and the distinction between proper and common sensibles are wholly absent. The abolition of forms and their replacement with figure, also noted above in our discussion of the external senses, will turn out to have especially far-reaching consequences when we attempt to connect the internal senses with the understanding.

We shall begin by examining his initial rather straightforward presentation of the common sense, imagination and memory. After that we will consider his attempts to connect the process sketched so far with the understanding and the problems this generates.

1. The Common Sense

His discussion of the common sense is really quite sketchy. He says:

> While the external sense is stimulated [movetur] by the object, the figure which is conveyed to it is carried off to some other part of the body, that part called the common sense, in the very same instant and without the passage of any real entity from one to the other. It is in exactly the same manner that now when I write I recognize that at the very moment when the separate characters are being written down on the paper, not only is the lower end of the pen moved, but every motion in that part is simultaneously shared by the whole pen. All these diverse motions are traced by the upper end of the pen likewise in the air, although I do not conceive of anything real passing from the one extremity to the other.[HR I pp. 37-38]

Whether the common sense is to be identified with the tip of the pen or with what it writes on is not entirely clear, but it is clear that the common sense has been materialized and identified with a part of the body.

His emphasis on the fact that no real entity passes from the external senses places him more in the Aristotelean tradition rather than the Epicurean tradition which supposed that little eidola or copies are sent by the object, received by the sense and transmitted inward through little pores. The example of the pen, however, emphasizes the purely mechanical nature of the process of transmission, as opposed to the more qualitative approach of Aristotle.

2. Imagination/Memory

The imagination and memory are similarly treated:

> ... we must believe that the common sense has a function like that of a seal, and impresses

> on the fancy or imagination, [fantasia vel imaginatio] as though on wax, those very figures and ideas which come uncontaminated and without any bodily admixture from the external senses. But this fancy is a genuine part of the body, of sufficient size to allow its different parts to assume various figures in distinctness from each other and to let those parts acquire the practice of retaining the impressions for some time. In the latter case we give the faculty the name of memory. [HR I p. 38]

This passage emphasizes very strongly the purely corporeal character of the imagination and memory. The comparison with wax and the references to the imagination being big enough so that the figures can be kept distinct from each other, and the parts retaining impressions, also lead the reader to think of the figures received by the imagination in a very literal way as impressions in some soft substance.

There are, however, several things in this passage which do not seem to fit in with this sort of mechanistic, materialistic interpretation. He speaks of "figures and ideas" -- a surprisingly incongruous conjunction. And he says that they come "uncontaminated and without any bodily admixture from the external senses" [a sensibus externis puras et sine corpore venientes]. Several critics have seized upon these phrases and argued that they provide evidence for the persistence in Rule XII of the scholastic theory of sensible species.

Jean Roy, in L'imagination selon Descartes focusses upon the phrases we have just been considering, arguing that they show that Descartes is trying to make figure into some sort of quasi-spiritual intermediary between mind and matter, and that it thus has a role analogous to species in the tradition.[36/]

Although a study of the Thomistic and later scholastic theories of species is beyond the scope of this essay, I nonetheless believe we should be very cautious about attributing this theory to Descartes here, and that, on the contrary, there is nothing in these passages which cannot be reconciled with a completely materialistic mechanism. The phrase "pure and without any bodily admixture" for example, which Roy cites as evidence for the idea that Descartes is trying to elevate "figure" to be a sort of intermediary between mind and matter,[37/] can be interpreted as we interpreted the phrase "without the passage of any real entity" above. In other words it is not the figure transmitted which is "pure and without bodily admixture" (and thus somehow partially spiritual); rather it is that the mode of transmission does not involve the transmission of some material thing, such as little

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36/ See, for example, Jean Roy, L'imagination selon Descartes pp. 16-25

37/ Roy, op. cit. p. 24

copies or eidola. If the upper end of the pen traces figures in a piece of wax, those figures are not somehow spiritual just because nothing material has passed from one end of the pen to the other. On the contrary, Descartes emphasized the fact that these figures take up some space in the imagination.

His puzzling conjunction of "figures and ideas", however, is difficult to explain. Is he meaning to treat the two as synonyms? If so, how could ideas be impressed in a purely corporeal imagination as he describes? The phrase in question can, doubtless, be read as a, perhaps unconscious, attempt to upgrade "figure" so that the transition to the understanding will be smoother. It could be read equally well, however, as materializing ideas. After all, in Traite de l'Homme, Descartes says that the figures traced in the surface of the pineal gland by the departing animal spirits:

> .... must be taken for ideas, that is to say, for the forms or images which the reasonable soul considers immediately when, united to this machine, she imagines or senses some object. [AT XI p. 176]

It seems, then, that Descartes could well be intending to materialize ideas. Or we could simply say that his thinking and terminology are so confused here that it is impossible to determine with any precision what he means. However we interpret his conjunction of "figures and ideas" here, however, it does not provide us sufficient grounds

for believing that figures are not material in nature, or that Descartes, therefore, holds the scholastic theory of species, or even that figure is analogous to species -- at least not if the analogy is supposed to be based upon the quasi-spiritual nature of figures.

Professor O'Neil's position in Epistemological Direct Realism in Descartes' Philosophy is somewhat more complex than Roy's. He acknowledges the materiality of figures, but nonetheless thinks that Descartes has developed a theory of sensible species "within an essentially traditional or scholastic framework".[38] He states that according to the traditional system:

> What is truly present to the internal senses is the thing-in-its-act, in its actus, present by its action. This result Descartes wanted, but he lacked the key element: form. So he made do with figure and motion. He wanted the essence, so to speak, of what is real in the world to become directly known by the internal sensory system, and he did not want any intermediary or any "cluttering matter." Thus he speaks of the passage of "no real entity," of the lack of "bodily admixture." But he does insist that the imagination receives from the common sense those very figures and ideas (easdem figuras vel ideas) that came originally from the external senses. He has sketched a theory of sensible species which operates without forms.

38/ O'Neil Epistemological Direct Realism in Descartes' Philosophy p. 54

He elsewhere described what Descartes has developed in the Rules as a "personal theory of species",[39] "a physicalistic version of the Aristotelean/Scholastic theory",[40] "his own version of sensible species,"[41] etc. Generally, then, he holds that Descartes has developed a sort of mechanistic version of the scholastic theory. To a large extent, I think this is a fair statement of the case; what we find in Rule XII is an attempt to import Descartes' own mechanistic approach into the traditional framework. However, I would not, therefore, say that Descartes is within the traditional framework, since Descartes' quantitative and mechanistic approach is fundamentally inconsistent with the traditional theory.

3. The Link with the Understanding

Descartes begins his discussion of the last step in the perceptual process by saying:

> Finally... we must think that that power by which we are properly said to know things is purely spiritual, and not less distinct from every part of the body than blood from bone, or hand from eye. [HR I p. 38]

It is at this point that Descartes' problems become acute. As discussed in the preceding sections, he has

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39/ O'Neil, op. cit. p. 54.

40/ O'Neil, op. cit. p. 3.

41/ O'Neil, op. cit. p. 48.

thrown out the Aristotelean metaphysical distinctions. He has not brought in any of the somewhat more complicated machinery elaborated by the Thomistic tradition on the basis of the Aristotelean texts: the impressed species, the expressed species, the phantasms, the function of the agent intellect and the possible intellect, etc. Although he condemns the scholastics, he fails to offer his own theory of abstraction to fill the gap, and this, as Beck notes, is a serious deficiency of his account here.[42/] Put simply, the problem is that he has figure (and perhaps motion) conveyed to the imagination, but the mechanical wax-seal model cannot be extended to the link with the understanding, since this latter is purely incorporeal. Descartes himself states that the cognitive power:

> ... resembles now the seal and now the wax. But the resemblance on this occasion is only one of analogy, for among corporeal things there is nothing wholly similar to this faculty. [HR I p. 39]

How, then, are we to explain the interaction? That there <u>is</u> interaction he is quite clear, for he says the understanding "can be stimulated by the imagination, or on the contrary act on it." The mind, he says, "forms new ideas in the fancy," or turns "to the imagination in order to create fresh impressions". When it is doing this it is "imagining" or "conceiving", and if it acts alone it is

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42/ Beck, <u>The Method of Descartes</u>, p. 29.

said to "understand". If it "applies itself along with the imagination to the commmon sense" it is said to see, touch, etc. But it is really the incorporeal mind which in all these cases enables us to know. The mind or understanding, then, perceives in cooperation with the inner senses, but how this sort of cooperation can occur is not explained. Descartes does not seem aware in these passages of the seriousness of the problem he faces in explaining the interaction of the understanding and the imagination. And one reason for this, I suggest, is the shifting terminology which he uses to describe what is transmitted. In discussing the link between the understanding and the imagination he uses the terms "impression", "idea", "figure" and "image" interchangeably. A few pages later he even brings in the term "form".[43/]

His thought at this point is obviously in a rather inchoate state. "Figure" or "impression" as he has been using them are wholly corporeal, but he wants them to do the same job that the forms or species of the tradition did, so he tries to blur their corporeal nature by throwing in terms like "idea" or "form" which have more of a mental connotation, and "image" which seems to be between the two. Although such shifting and ambiguous use of

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43/ All quotations in this paragraph appear on pp. 38-44 in HR, Vol. I. The word "form" appears on p. 44.

terminology cannot really solve Descartes' problem; it does paper over the gap, preventing him from seeing the seriousness of the problem.

Summary: Internal Senses

Briefly, then, what Descartes has done with the inner senses has been to extend to them the mechanism he set out in discussion of the external senses, to materialize them, explaining how the figure received by the external sense comes to be traced upon the imagination (via the common sense). Having postulated the understanding or cognitive power to be purely spiritual and incoporeal, however, he has been unable to successfully connect it with his mechanistic explanation of the operation of the senses. That the gap is bridged somehow he has no doubt, but he has been unable to provide a coherent explanation of how this happens.

C. The Rules: Seeds of Future Problems

Although we do not have in the Rules the methodic doubt which in later works makes our knowledge of the external world problematic, we nonetheless find that certain aspects of the theory of perception he has developed there could logically lead to the view that our knowledge of the external world is indirect. It is the imagination which is the focal point for these problems, since it is the point of contact between the cognitive power and the corporeal images conveyed from the external senses. As

such, it is essential for explaining how the understanding is enabled to know corporeal things -- either our own body or external objects. Descartes himself says in Rule XII that:

> ... if the understanding proposes to examine something that can be referred to the body, we must form the idea of that thing as distinctly as possible in the imagination; in order to effect this with greater ease, the thing itself which the idea is to represent must be exhibited to the external senses. (emphasis added) [HR I pp. 39-40]

Leaving aside the difficult question of whether what is formed in the imagination is an "idea" or a purely corporeal image, we note that it "represents" the thing itself. The mind's contact with the world is via the imagination. Therefore, as Descartes notes later in Rule XII, we could easily be deceived if our imagination is diseased. In order the avoid error, he says, the "wise man":

> ... will judge that whatever comes to him from his imagination is really depicted on it, but yet will never assert that the object has passed complete and without any alteration from the external world to his senses and from his senses to his imagination, unless he has some previous ground for believing this. [HR I p. 44]

The obvious question which Descartes does not pose at this point is that if our only contact with the world is via ideas or images in the imagination, how can we ever tell how well they represent things?

It may seem that this is a problem shared by all theories of perception. Surely, even Aristotle acknowledged that a malfunctioning body can cause errors of perception. This is doubtless true. However the changes which Descartes has made in the Aristotelean metaphysical framework give a distinctively new twist to the problem. The most important of these for our purposes are his view of the relation between soul and body and his rejection of the theory of forms. These two are related, of course, since souls are a subclass of forms.

Looking first at soul and body, we find that contrary to the traditional view which saw the soul as the act or form of the body as a whole (although able to perform some of its functions independently of the body), Descartes has made of it a separate thing. He has reified it, and indeed almost materialized it, if one can say this of a spiritual thing. The above-quoted passage where he says it is "not less" distinct from everything corporeal than blood from bone is indicative of the way he is thinking. An Aristotelean would not thus treat the intellect as just another sort of thing like blood or bone, with only the peculiarity of being noncorporeal.

Etienne Gilson argues that Descartes misunderstood the scholastic notion of a form, supposing it to be an immaterial substance which is joined to a corporeal substance to form a purely corporeal substance, rather than a

complementary principle to the principle of matter in the constitution of one substance.[44] This, he says, is because for Descartes every true idea must correspond to some substance. Since the soul is, after all, a form, it would seem that the same tendency is at work here, leading Descartes to make the cognitive power a thing. He seems unable to think of anything without reifying it, a tendency which I believe should be attributed more to a kind of instinctive materialism (at least at this point in his career) rather than to any explicit theory about true or false ideas.

Having thus reified the cognitive power and made it a separate thing from the imagination or the common sense, a gap has been created. The cognitive power confronts something which is fundamentally other than itself; the imagination and the images in it confront the mind as an object. There is a sharp break rather than the continuity we find in Aristotle.

The abolition of forms also has a powerful impact upon one's understanding of perception, since as we noted in Chapter I, forms in the Aristotelean system served as a kind of bridge between the perceiver and the object. The form of the object (which makes it be the kind of thing it

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44/ Gilson, Etienne, Etudes sur le Role de la Pensee Medieval dans la Formation du Systeme Cartesien, pp. 162-3.

is) also can exist (intentionally) in the perceiver, enabling him to know the object. The object acts in the perceiver through its form, and the understanding receives that form; it becomes the thing perceived (on an intentional level of course). This obviates the need for any sort of third entity between the perceiver and the object.

Descartes wants this sort of unity of knower and known. The passage quoted on page 98 for example, shows a strong desire to have the object itself somehow pass over into the perceiver. His whole doctrine of the objective reality of ideas ["esse objectivum"] also bears witness to his desire to have the object somehow get into the mind, and his conviction that it does. In his attempt to elucidate the notion of esse objectivum in the Reply to the First Objections, Descartes clearly wants to hold onto the scholastic belief that objects have a sort of existence in the mind. He speaks of "objects existing in the understanding in that way in which objects are wont to be there,[45] and says:

> ... the idea of the sun will be the sun itself existing in the mind, not indeed formally, as it exists in the sky, but objectively, i.e., in the way in which objects are wont to exist in the mind... [HR II, p. 10, latin AT VII:102, french AT IX:82]

45/ AT IX p. 82.

The problem, however, is in explaining how the reality of the object gets into the mind. Having rejected the traditional explanation of how this occurs, he is left with a gap between the mechanistic explanation of the senses and the understanding. Figure, unlike the traditional forms, cannot exist in an immaterial mind, and Descartes' attempts to elaborate a theory of vision based upon it lead him into some novel and interesting difficulties, as will be discussed in Chapter IV.

III.

THE IMPORTANCE OF PERCEPTION AND THE PLAN OF THE DIOPTRICS

By 1628 or at least by 1629, then, Descartes' opposition to the Aristotelean system had crystallized. In the Rules he had attempted to integrate some of his new ideas into the traditional account of perception. The fit had been far from smooth, and the results sketchy at best. Although his innovations might eventually prove very fruitful, and he doubtless had confidence in the general direction he had set, it was clear that more work was needed. Given his ambitions to be the founder of a new universal science replacing the Aristotelean system which had dominated Western thought for so long, it is helpful to step back at this point and look briefly at the reason why he saw perception as important to his plan.

In seeking to replace the scholastic principles of explanation (act and potency, forms, real qualities, etc.) with his own mechanistic ones, he must be able to explain the phenomena of our experience as well as they do. At least superficially, the traditional system accords far better with our everyday experience and with common sense. As Descartes himself says at the end of the Principles:

> ... up to this point I have described the earth and all the visible world, as if it were simply a machine in which there was nothing to consider but the figure and movements (of its parts), and yet our senses cause other things to be presented to us,

> such as colors, smells, sounds and other such things of which I did not speak, it might be thought that I had omitted the main part of the explanation of the objects of nature. (Principles Part IV No. 188 [HR I p. 289])

He must, then, explain the facts of perception in such a way that they can be shown to support his physics, or at least not pose an objection to it. He must explain such qualitative features of the world as colors, relying only upon extension, figure and motion.

Perception takes on a special significance in his struggle against the scholastics, also, because he believed that the scholastics had assumed real qualities largely in order to explain sense perception. In the Response to the Sixth Objections he states:

> ... because the principal reason which moved philosophers to posit real accidents was that they thought that the perceptions of the senses could not be explained without assuming them, I have promised that I will explain these facts minutely with reference to each sense in my Physics. Not that I wish that any of my opinions should be taken on trust, but that I thought that those who have judged correctly in the matter of those accidents which I have already explained in the case of vision in my Dioptrics will easily guess what I am able to make good in the case of the others. (HR II p. 250)

If, thus, it was chiefly in order to explain perception that his opponents needed to have recourse to real accidents, occult qualities, etc., then Descartes' ablity to provide a successful mechanistic explanation of these very phenomena (sense perception), would be a major victory over

the scholastics, driving their theory from the field in the very cases where it was thought strongest.

That he thought he had successfully done this in the Dioptrics is also evidenced by another remark in the Response to the VI objections:

> When I see a staff it is not to be thought that intentional species fly off from it and reach the eye, but merely that rays of light reflected from the staff excite certain motions in the optic nerve and, by its mediation, in the brain as well, as I have explained at sufficient length in the Dioptric. [AT IX pp. 236-7]

If we add to these considerations the fact that vision was commonly regarded as the most spiritual of the senses, it is clear that a victory here would be very persuasive.

Descartes' works on vision, thus, far from being tangential to his main goals, are in fact very important to his plan of attack against the scholastics. After all, it was in the Dioptrics that we first find him triumphantly exclaiming:

> And by this means your mind will be delivered from all those little images which fly through the air, called "intentional species", which so trouble the imagination of the philosophers. [AT IX, p. 85]

However, it is also in the Dioptrics that he has to really come to grips with the problems we have touched upon in our discussion of the Rules. What kind of images are involved in visual perception, and exactly what role do they play? How can he connect the mechanics of vision --

the physics and physiology of it -- with our perception of the qualitative aspects of nature, in particular our perception of colors -- a topic not touched on in the Rules? Will he be able to avoid what O'Neil calls the Cartesian "lockup"[46] -- the brain-bound mind scrutinizing the images formed in the cerebral cavities? Given that he supposes that the mind perceives only insofar as it is joined to the body at the pineal gland, our spatial perception becomes problematic. How can we perceive objects out from us in space, discerning how far away they are and in what direction? Indeed, even our perception of the spatiality of our own body becomes hard to explain.

Given our interest in the development of perceptual idealism, a careful examination of Descartes' theory of vision is necessary. It is in explaining vision, and most particularly in explaining our visual spatial perception that we see Descartes struggling with the problems which push him more and more in the direction of postulating an inner object of perception. In the next chapter we will deal with the physics and physiology of vision, contrasting Descartes' theory with the Aristotelean one sketched in Chapter I. In Chapter IV we will focus specifically on his account of spatial perception and the problems this generates for him.

46/ O'Neil, op. cit., p. 61

CHAPTER III

DESCARTES' THEORY OF VISION: PART I
THE OBJECTS OF VISION: LIGHT AND COLOR

INTRODUCTION

As we saw in the preceding chapter, Descartes' theory of perception as articulated in the Rules, left many questions unanswered, especially in explaining how his mechanistic account of the senses was to be connected with the incorporeal cognitive power. There was an implicit danger that the ideas/figures in the imagination might emerge as some sort of representational entity or third thing between the knowing power and the object. Furthermore, very little had been said which bore directly upon the perception of qualities -- sounds, colors, etc. -- something which Descartes realized he must explain if his theory was to win out over the scholastic one.

It was, thus, important to him to work out more carefully the way in which perception was to be explained according to his mechanistic principles. In this chapter and the next, then, we will examine carefully his attempt to do this, focussing on vision, since Descartes devoted considerable time and expense to his study of vision, often performing complicated and costly experiments.[1/] He

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1/ For a discussion of his experimental work in optics, see Scott, The Scientific Work of Descartes, Chapter IV. A very thorough and scholarly account of his early scientific work is also found in G. Milhaud's Descartes Savant.

regarded his explanation of it as a model for how the other senses were to be explained since he believed all the senses developed from the same part of the original embryo,[2/] and that their manner of function is essentially the same.

In this chapter we shall examine his attempt to provide a mechanistic account of the objects of vision -- light and color, and will discuss the significance of his very far-reaching changes in the Aristotelean/Thomistic way of looking at these, while in Chapter IV we will turn to his account of the physiology of vision, and to the problems he has in explaining visual spatial perception -- problems involving the role which the images projected to the pineal gland play in vision.

We shall begin this chapter with a discussion of Descartes' committment to mechanism and the way in which this placed certain constraints upon what sort of explanatory principles he could employ in explaining the process of vision. In the next section we will look at the historical context and at the important role played by optics in the struggle between the Aristoteleans and the new mechanistic science. This will put us in a position to appreciate what was truly innovative in Descartes' treatment of

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2/ Pucelle, "La Theorie de la Perception Exterieure Chez Descartes", p. 300, referring to Traite du Corp Humain.

light and color, and to understand its importance. In the remainder of the chapter we will examine the specifics of the way in which he works out his mechanistic explanation of light and color.

Our main text for Chapters III and IV will be the Dioptrics which was published in 1637 as an essay appended to the Discourse on Method. It is the only work on vision published during his lifetime, and he was apparently quite content with his account of vision there, since he continued to refer readers to it throughout his life.[3/]

His two posthumeously published works Le Monde: Traite de la Lumiere and Traite de l'Homme, however, also contain a great deal which is relevant to understanding Descartes' theory of vision -- much of which is not included in the Dioptrics, due to its more pragmatic orientation toward improving our vision with lenses and telescopes. The nature of light and the role of the animal spirits in perception, for example, receive much fuller treatment in the earlier unpublished works. Material from these earlier works will be brought in, then, to supplement the account in the Dioptrics, since we have no reason to

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3/ See, e.g., VIieme Responses, AT IX, p. 235, Meteors VI, 331; Passions of the Soul I, 12 and I, 13, (AT XI pp. 337, 338); Traite de l'Homme, AT XI, pp. 153, 156,187; Principles of Philosophy IV, 187, author's letters to translator of Principles, HR I, p. 212, Notes against a program, HR I, p. 443.

suppose that he ever abandonned the theories propounded in them. On the contrary in the Discourse he says that he has arrived at the successful results in optics, geometry and meteorology based upon his new method, and upon his physics -- the foundations of which are to be found in the treatises which he is withholding from publication (i.e. Le Monde and l'Homme).[4/]

I.

DESCARTES' COMMITTMENT TO MECHANISM

As a practicing scientist Descartes was firmly committed to mechanism; among historians of science there is general agreement on this point. This comes out more clearly in the unpublished works Le Monde and L'homme than in the Dioptrics, possibly because the condemnation of Galileo had shown Descartes the unexpectedly firm commitment of various churchmen of the times to the Aristotelean system. A brief discussion at this point of the sense in which Descartes' system is mechanistic, then, will help us to understand the philosophical assumptions with which he approaches the study of light, color and vision in general.

Definition of Mechanism

First of all, mechanism can be taken to be a methodological committment to certain sorts of explanatory

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4/ Discourse on Method, Sixth Part, esp. 59-61 Olscamp., H.R. Vol. I pp. 127-129.

principles in science. Dijksterhuis characterizes it thus:[5/]

> Cartesian physics... is mechanistic in character. This implies that it uses no explanatory principles other than the concepts employed in mechanics: geometric concepts such as size, shape, quantity, which are used by mechanics as a department of mathematics, and motion which forms its specific subject.

Thus we find every aspect of the visual process explained in terms of the extension, figure and motion of the particles of matter. There is no void or action at a distance. Thus, for example, we have light explained as a pressure which luminous bodies exert upon the air particles, which in turn press against the eye. We have colors explained in terms of the spinning motions of the light particles, the nerves explained in terms of pushing or pulling a semi-rigid body, etc. There is no essential difference between the way the body functions and the way inanimate objects do; the principles of mechanics are applied equally to both.

Mechanism, however, was more than a set of explanatory principles. It was linked with a view about the nature of reality, as Dijksterhuis in the next part of the passage quoted above points out:

5/ Dijksterhuis, Mechanization of the World Picture, p. 414.

> It recognizes as actually existing in nature only those things which can be described and explained by means of these concepts. It not only excludes all notions of animation, internal spontaneity and purpose, but it also denies all internal change in the particles of matter, which it looks upon as the ultimate building blocks of perceptible bodies; it also banishes from physics all secondary qualities of matter, which it regards as states of consciousness. [pp. 414-415]

It might be objected, at this point, that one's scientific methodology and one's metaphysics are not that inseparably linked; that one could advocate a mechanistic methodology in science while maintaining a sort of agnosticism about the real natures of the things and processes thus explained. Indeed, Descartes sometimes seems to be doing this very thing. He assures the reader that he is merely showing that it is unnecessary to postulate substantial forms, real qualities, etc., that he can explain the phenomena of nature without them, but that he is not denying their existence. As discussed in the previous chapter, however, there is every reason to suppose that these disclaimers are politically motivated, and no reason to suppose that Descartes was genuinely agnostic about the nature of the physical world, believing that perhaps there really are substantial forms and real qualities, or the

sorts of things listed in the preceding quotation, most of which characterized the Aristotelean system.[6/]

Mechanism, then, involved both methodological principles specifying what sort of explanations were acceptable in science and also certain implied metaphysical assumptions about the nature of reality. On both of these levels it was profoundly inimical to the Aristotelean system. Of the Aristotelean four causes, only material and efficient causes are recognized; formal and final causes have no place in mechanistic explanation. Thus, their notions of explanation are irreconcilably different. And since Descartes' metaphysics excludes all qualitative aspects of the world, the whole framework within which they are working is fundamentally different.

Mechanism and the Use of Models

Not only is Descartes' philosophy mechanistic in the senses discussed above, but he also has a marked preference for having recourse to models or analogies as a way of explaining phenomena. This is a deep and persistent aspect of his thought and not just a way of avoiding the

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6/ A list of the concepts of Aristotelean physics already rejected by Descartes in Le Monde is found in Gilson's annotated translation of the Discourse: Text and Commentary, pp. 272-3.

controversies which raged around Galileo.[7] The kind of models he seeks to develop are ones which explain microscopic phenomena by analogy with medium-sized objects readily accessible to the senses. Wallace hypothesizes that his choice of this sort of model is traceable to his emphasis upon clear and distinct ideas in his method, and describes Descartes' "faith in his ability to reduce all physical phenomena to easily imaginable mechanical motions" as a "shortcoming" in his methodology.[8]

Descartes' explanation of both light and colors relies, as we shall see, very heavily upon the use of models. Both Le Monde and L'Homme explain the physical world by giving us fables or models; the body is understood by analogy with a machine, and his account of the nature and genesis of the elements in Le Monde is explicitly treated as a fable which will help us understand things by understanding how they might have come to be (although we know they did not).

Descartes defends this sort of explanation very strongly. In a letter to Morin in 1638 he says:

7/ Desmond Clarke. Descartes' Philosophy of Science, pp. 122-3 argues for this citing, among other things, a letter to Mersenne of 1630 in which Descartes already speaks of his physics in terms of a "fable." AT I, p. 179.

8/ Wallace, The Scientific Methodology of Theodoric of Freibourg, p. 261.

> I claim that they [models and analogies] are the most appropriate way available to the human mind for explaining the truth about questions in physics; to such an extent that, if one assumes something about nature which cannot be explained by any analogy [comparaison] I think that I have conclusively shown it is false. [AT II, p. 368, Clarke p. 122.]

This sort of methodology is, however, susceptible to criticism on a number of fronts. The value of explanation by analogy is, for a start, highly suspect in physics, since there are always disanalogies as well. It is not self-evident, certainly, that microscopic phenomena behave like scaled-down versions of macroscopic processes. Indeed, as modern physics has shown us, quite different concepts may be applicable to the two sorts of phenomena, and not all scientifically acceptable theories involve easily visualizable models. Very few do, in fact. It can be argued, I think, that it was Descartes' excessive reliance upon this type of analogy or model which was most responsible for the sterility of his scientific method.[9/]

Desmond Clarke, in a recent book, Descartes' Philosophy of Science, brings out several other philosophically very interesting points about Descartes' reliance upon

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9/ Wallace takes essentially this position (op. cit., pp. 261-63), as does Scott in The Scientific Work of Rene Descartes. He states that Descartes' attempts to reduce bodily functions to easily imaginable mechanical motions "led him to make almost every mistake it was possible to make." p. 23.

models of this sort. The requirement that all aspects of the model be so simple and easy to imagine that no one could even pretend not to know them[10] stems, Clarke argues, from a sort of "conceptual empiricism", a kind of "crude empiricism in Descartes' conceptual scheme" -- something often overlooked by commentators who focus on Descartes' mathematicism. In fact, Clarke argues, Descartes had largely lost interest in mathematics by 1630 (or at least in abstract mathematics). The actual mathematics required to describe physical reality was so complex as to be unmanageable, and thus, having rejected the scholastic principles of explanation, he fell back "for want of anything better" to crude models drawn from our everyday experience and described in non-theoretical language.[11]

The other important point Clarke brings out relating to Descartes' use of models is that it leads him in the direction of an instrumentalism according to which the value of a model lies solely in its explanatory value rather than its truth. This attitude comes out clearly in the Principles where he says:

> I wish everything I write from this point forward to be regarded as an hypothesis. Even if they are thought to be false, I think

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10/ AT VI, pp. 42-3, HR I, p. 107-8.

11/ Clarke, op. cit. p. 122.

> it will have been worthwhile if everything I deduce from these hypotheses agrees with experience. For we can see that they are as useful for life as the knowledge of the truth itself. [AT VIII-1, p. 99; IX-2, p. 123]

In earlier works, also, we find similar expressions of this instrumentalism. He justifies his use of models or comparisons in explaining light by saying that he is:

> imitating in this the astronomers who, although their assumptions are almost all false or uncertain, nevertheless ... never cease to draw many very true and well-assured conclusions from them. [Olscamp, p. 66-7]

The fable he introduces in Le Monde, (discussed below) is offered for its explanatory value only, with no claim at all being made for its truth, since it conflicts with Christian revelation.

This instrumentalist outlook can, I think, be seen to explain why it is that Descartes is so apparently unconcerned about the inconsistencies among his three models for explaining light (discussed below).

Thus, although Descartes is a mechanist, his mechanism is given a special personal character by his committment to the use of a certain type of models. It is probably this tendency to provide easily visualizable models relying upon everyday objects which accounted for much of the popular appeal of the Cartesian form of mechanism, and its success in routing from the field the 14th and 15th century scholastic notions which required a sort of metaphysical

reflection to grasp and which had become encrusted with overrefinements and abstract speculations.

Mechanism and Vision

Descartes is very concerned to provide a scientific explanation of the actual physics and physiology of vision, and reproaches the scholastics for failing to explain these. This comes out in the fourth discourse of the Dioptrics where he says:

> ... it is necessary to beware of assuming that in order to sense, the mind needs to perceive certain images transmitted by the objects to the brain, as our philosophers commonly suppose; or at least the nature of these images must be conceived quite otherwise than as they do. For inasmuch as they (the philosophers) did not consider anything about these images except that they must resemble the objects they represent, it is impossible for them to show us how they can be formed by these objects, received by the sense organs, and transmitted by the nerves to the brain. (Emphasis added) [AT VI, p. 113]

He is reacting in this passage more against the corrupted late scholastic theory of sensible species which resembled the eidola of the Epicureans more than the forms or species of Aristotle or St. Thomas. Nonetheless the important point which emerges is his thirst for a scientific explanation of the actual mechanisms of vision by contrast with the more philosophical or abstract level of explanation provided by the scholastics.

Descartes' conception of what a scientific explanation is, however, is determined by the fact that he equates "scientific" with "mechanistic". On the basis of the preceding discussion of Descartes' mechanism, then, we can see the lines along which his explanation of vision will have to develop. First of all, his explanation of all aspects of the visual process -- light, color, the eye, the nerves, etc. will all have to be cast in terms of the size, shape, quantity and motion of particles of matter. And, secondly, he will try to explain the microscopic phenomena involved by constructing models or analogies with middle-sized objects.

Before we turn to the specifics of the way in which Descartes works out a mechanistic explanation of light and color, we pause to look at the historical context within which these theories were first presented to the public, and to consider some of the philosophical issues which were at stake in the controversy between the mechanists and the Aristoteleans -- at least insofar as these affected the way people understood perception.

II.

OPTICS AND THE VICTORY OF MECHANISM OVER THE ARISTOTELEANS

Descartes' mechanistic explanation of light and color suffers from some serious problems and inconsistencies, as we shall see below. Nonetheless, looked at from the

vantage point of the subsequent history of philosophy, his theory was eminently successful in accomplishing what he set out to do, and indeed, can be seen as a sort of philosophical watershed. To appreciate its significance we must look at it within its historical context.

A. The Historical Context and the Importance of Optics

The 17th century, as is well known, was a period of great ferment in science, and one in which Aristotelean physics was finally and decisively driven from the field by physical theories of a mechanistic nature -- a process culminating in the emergence of what is called "classical science" (Newtonian mechanics). Descartes, although not for the most part an innovator, was an important participant in the mechanistic movement; his talents as a popularizer brought mechanistic science within the reach of the non-scientists, and his boundless self-confidence and passion for system-building captured the imaginations of many.

The assault on the Aristotelean system was, of course, being carried on on a number of fronts simultaneously by numerous people. Optics, however, was arguably of special importance in the battle, and this for a number of reasons. First of all, optics was at the time one of the most popular of the sciences among educated people, and therefore books in this area found an eager audience and exerted considerable influence.

Secondly, vision is very central to our whole way of thinking about the world, our place in it, and even our understanding of how we think. Thus, if a philosopher can get us to accept an explanation of vision consistent with his metaphysics, this will have a deep effect on the way we think about the world. Berkeley understood this fact as well as Descartes did. Berkeley wrote the New Theory of Vision to explain away the fact that we seem to see objects at a distance from us in space, and thus win people over to his idealist metaphysics. In a similar way, the Dioptrics explains vision in a way that will lend support to, or at least not conflict with, his mechanistic view of the world. Persuading people to understand vision in a way consistent with the philosophy one is trying to defend, is thus tactically important.

The final reason for the importance of optics is that of all the senses vision is the one which, on the face of it, seems the most unlikely candidate for mechanistic explanation. Thus there was a great deal of resistance both from common sense and from the scholastic philosophers to the whole idea of a mechanistic explanation of light and especially colors, and a victory in this area would be especially persuasive.

Common sense would oppose a mechanistic explanation of light and colors because such explanations require action

by contact, and objects obviously do not touch our eyes -- this is what makes vision somehow special and mysterious. Furthermore, common sense tends to cling stubbornly to the belief that objects have the qualities our senses reveal to us. They just are hot or cold, sweet or sour, soft or hard, red or blue, etc.

The Aristotelean tradition had provided a philosophical vindication of common sense on this latter point and held that objects really have the qualities our senses disclose to us. This fact was not lost on Descartes, who condemns the Aristoteleans for following common sense, and wrongly relying upon the senses, calling the philosophy of the Aristotelean/Thomistic tradition "la philosophie vulgaire" because of this. In fact he develops a whole psychological explanation of how the Aristotelean belief in real qualities originates in the errors of our infancy, when we are so bound up with our body and its needs that we view things wholly in terms of the sensations they cause in us.[12/]

The opposition to a mechanistic explanation of colors, in particular, was quite strong. Ronchi, an historian of theories of light, states that at the start of the 17th century the study of light had more or less been relegated

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12/ Gilson, Etudes sur la role de la pensee medievale dans la formation du systeme Cartesien, p. 168-173.

to physicists, but that colors were still regarded as the province of philosophers.[13] He sees Descartes' work on colors as an important part of the "battle to liberate colour from the clutches of the philosophers of the old school."[14] To understand why the Aristoteleans were so resistant to a mechanistic treatment of colors, we must consider several factors.

First of all their firm committment to the distinction between proper and common sensibles stood against a mechanistic theory of colors, since such a theory would reduce them to common sensibles like number, figure and motion. And secondly, it had been held ever since Aristotle that vision was the most spiritual of the senses in that it was able to receive forms of sensible objects without their matter to a greater degree than, say, touch, which involved greater material alteration in the sense organ itself, and was held to be the least spiritual of the senses -- the one shared by all animals, while only the higher animals have vision. Reducing vision to a form of touch, then, as must be done if we are to explain it mechanistically, was particularly offensive, as it would be seen as a kind of lowering of man to the level of the lower animals.

13/ Vasco Ronchi, The Nature of Light, p. 114.

14/ Ronchi, op. cit., p. 119.

For all the foregoing reasons, then -- because optics was such a popular science, because vision is so central to the way we think about the world, and because of the strong resistance to a mechanistic explanation of vision on the part of both common sense and the Aristotlean philosophers, -- Descartes' work on light and color was an important contribution to the victory of the mechanistic natural philosophers over the Aristoteleans.

B. The Victory Over Aristotle

Descartes was largely successful in his attempt to replace the Aristotelean understanding of light and color with his own. Indeed he was so successful that we, as heirs to the Cartesian tradition, tend to look at the problems of perception wholly within the framework Descartes set up, finding what he says quite uncontroversial and obvious, whereas it was in fact quite revolutionary at the time. Thus it will be helpful to look a bit more deeply at how Descartes' victory changed people's understanding of light and color.

As we saw in Chapter II, Aristotle's approach to light and color was characterized by an acceptance of the reality of qualitative features of the world and of the possibility of qualitative change. Thus light was understood to be a qualitative change in the diaphanous medium and the colors of objects were communicated through the medium to the eye

by means of yet another qualitative change in the medium -- not by any sort of local motion. Colors were understood as real in a very strong sense, not being reducible to such common sensibles as shape or motion, as the atomists had tried to do. As a result of the belief that objects really have the qualities our senses discover in them, he had a positive attitude towards sense perception as an accurate guide to the way the world is.

Descartes, by contrast, does not acknowledge any sort of reality of colors as an irreducible element of reality. They must either be reduced to some sort of configuration and/or motion of the material particles, or else they must be identified with our sensations. In the Dioptrics and Meteors he applies color terms all along the causal chain, as we shall see below. He speaks of objects as being colored due to the configuration of the particles at their surfaces, of light as colored due to the spinning motions of its particles, and finally makes some statements in the Meteors which would seem to imply that colors have no existence except as sensations in us. He does not really identify colors exclusively with any one of these; nor does he distinguish between the ways in which objects, light and our sensations are colored. This left his successors arguing over whether colors are to be identified with the configuration of particles at the object's surface, with

the spinning motion of the light particles, with our sensation only or perhaps with some sort of disposition or power (Locke's view) in the object which enables it to cause our color sensations.[15/] If, however, we focus on these disputes we miss the real victory of Descartes -- namely the fact that after him people felt they had to choose among only these alternatives with the traditional Aristotelean theory not even being considered.

The sort of Aristotelean realism about colors which holds that they are real qualities of the object not reducible to anything more basic (like shape or motion) tends to disappear after Descartes. This change which we might describe as a metaphysical one -- a denial of the extramental reality of colors and other sense qualities -- led, of course, to important epistemological consequences. Just as Aristotle's view led naturally to a trust in the

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15/ It is of interest that Descartes does not use terms like "disposition" or "power" to describe what exists out there in the object. Although Haldane and Ross translate Principle CXCVIII to say that there is nothing like heat, cold, colors, etc, in external objects "but the various dispositions of these objects which have the power of moving our nerves in various ways" (HR I, p. 296), a more accurate translation is that there is nothing "but the diverse figures, situations, sizes and motions of their parts which are so disposed that they can move our nerves in all the different ways necessary to excite in our soul the diverse sensations..." Thus it is clear that all that Descartes regards as really out there in objects is the configuration and motion of their parts which are so arranged that they alter the spinning motion of the light particles.

reliability of the senses, Descartes' view led toward an extreme distrust in their reliability as will be discussed below.

C. Philosophical Implications of Descartes' Victory

The most important consequence of the victory of Descartes' mechanistic account of light and color over the Aristotelean one was that now people found themselves faced with a gap between the world of our feelings and perceptions and the world as mechanistic science tells us it really is. My sensation of light, for example, is nothing at all like a pressure transmitted by the second element particles, any more than my sensation of red has anything in common with, or any natural connection with the spinning motion of light particles. This gap was to cause considerable problems for subsequent philosophers, but Descartes, far from merely seeing it as an unfortunate consequence of his scientific account of light and color, actually goes out of his way to drive a wedge between the world as we experience it and the world as it really is.

The first ten pages of Le Monde are of considerable interest in this regard. In order to clear away the preconceptions of his readers which he believes would keep them from being open to his own mechanistic physics, he attacks the scholastic notions of real qualities and substantial forms. The arguments he gives there are of

considerable philosophical interest, and show clearly both the way in which he intends to drive a wedge between our sensations of qualities and what is really in the object, and the reason why he wants to do this.

The first sentence of Le Monde: Traite de La Lumiere puts the point clearly:

> Proposing to examine light, here, the first thing of which I wish to give you notice is that there can be difference between the sensation ["sentiment"] we have of it, that is to say the idea which is formed of it in our imagination by means of our eyes and what is in the objects which produce that sensation in us... which is called by the name of "light". [AT XI, p. 3]

Although each of us tends to naturally assume that our ideas are entirely similar to the objects they come from, he says, we really have no reason to assume this, and on the contrary there are many reasons why we should not. He then proceeds to give a series of arguments which could well have come out of the pages of Berkeley.

Words, he says, enable us to conceive the things they signify without resembling them. So could not nature have instituted some sort of sign which makes us have the sensation of light without resembling that sensation, just as laughter or tears enable us to read joy or sorrow in men's faces? In just the same way, he says, it is our mind which "represents to us the idea of light each time that the action which signifies it touches our eye." Most

philosophers, he says, admit that sounds are merely a trembling of the air, but our idea of the sound is not an idea of trembling air. Even touch is suspect; as there is nothing in the feather which resembles the tickling sensation, and a soldier may think himself wounded when his pain is caused by a twisted belt buckle.

His strategy, then, involves relying upon the already more widely accepted mechanization of sounds (which was not, however, accepted by the Aristoteleans), upon encouraging us to think of all sensation by analogy with tickling or pain which are obviously of a subjective nature, and by pointing to the fallibility of our senses. He also offers us an alternative model for thinking of perception -- namely that of a language -- the analogy Berkeley made so much of. It is interesting that even in this early work the gap between our sensation and what is out there is so great that innate ideas begin to emerge. This comes out in the passage quoted about the mind representing to us the idea of light when the action that signifies it touches our eye.

After giving his arguments, however, he pulls back slightly and says that he has not proved that light is different in the objects than it is in our eyes, but merely introduced a doubt about this so that our prejudice to the contrary will be overcome and we will be open to the explanation he is about to give.

His reason for wanting to drive such a wedge between our sensations and objects emerges very clearly in the next section where he is criticizing substantial forms. He says:

> Let another imagine if he wants in this wood the form of fire, the quality of heat and the action which burns it as different things; for myself I fear I would err if I were to suppose anything more than what I see must necessarily be there, I am content to conceive there the motion of its parts. [AT XI, p. 7]

He finds he can quite adequately explain why the wood burns on his theory. The fast-moving fire particles separate the finer particles in the wood from the coarser ones. Supposing the form of fire or the quality of heat on the other hand does nothing towards explaining it.

Put simply, Descartes wants mechanistic explanations of all natural phenomena. Real qualities and substantial forms do nothing to further such explanations, but rather would get in the way. Hence he wants to be rid of them. The sorts of arguments presented in Le Monde are applicable to all the qualitative aspects of nature, including, of course, colors, although colors are conspicuously absent from his discussion there.

It can, I think, be argued that his criticisms of real qualities presented above rest on a misconception of that theory. He seems to think the theory commits its adherents to the view that there is something exactly similar to our sensation in the object, a view which he rightly finds

implausible. This view is more like that of the atomists who supposed that only like can know like; the soul must contain air in order to know air, etc. The Aristotelean/ Thomistic tradition, by contrast, held that the same form or quality existed in the object and in the perceiver, but that it existed in a very different way in each, the existence in the perceiver being an intentional existence. The perceiver thus receives the form of red without becoming red, and nonetheless is truly knowing the redness of the thing. Descartes does not seem to grasp the difference between the way the form or quality exists in knower (intentionally) and the way it exists in the object, but insists on thinking of a kind of literal resemblance between the two which he then finds unacceptable.

An in-depth discussion of the extent to which Descartes misunderstood real qualities and substantial forms would, unfortunately, take us too far afield.[16/] The question is complicated by the ways in which the late scholastics had developed and modified these Aristotelean/ Thomistic concepts, and thus involves issues of what sources Descartes relied upon for his understanding of them. Suffice it to say here that Aristotle, at least, held that the form exists in a different way in the knower

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16/ An interesting discussion of this found in Gilson's **Etudes**, p. 162-3.

from the way it exists in the object, and was not thinking in terms of something just like our sensation existing out there in the object.

D. Sense Experience and the Doctrine of Clear and Distinct Ideas

Although our focus in this essay is upon Descartes' scientific work on vision, it is of interest to note that the doctrine of clear and distinct ideas which assumes such prominence in his more philosophical works strongly reinforces the way in which his work on light and color drives a wedge between the world and, for example, our sensations of colors. In the writings on physics and optics he gives us a mechanistic explanation of light and color which for the most part simply excludes light and color as real qualities of the world not reducible to figure, extension, number, motion, etc. This implicitly drives a wedge between light and color as they are in the world and our sensations of them. The way he uses the doctrine of clear and distinct ideas, it can be argued, approaches the problem from the opposite direction and achieves the same result.

Methodic doubt has the effect of driving a wedge between all of our ideas and the world. Following the proof of God's existence, then, we are left with all sorts of ideas and need to develop some criterion for determining which of these we can trust. Our starting point is, thus, a subjective one, by contrast with the scientific writings

which start by discussing the objects we perceive. His use of the criterion of clear and distinct ideas, however, results in the very same rejection of qualities that we found in his scientific writings.

The doctrine of clear and distinct ideas receives its most thorough articulation in the Meditations and in the Objections and Replies, particularly in his replies to Arnauld. Reduced to the bare bones, the doctrine he propounds is that it is only our clear and distinct ideas which can be trusted to truly inform us about the world. Ideas such as those of magnitude, extension, figure, situation, motion, etc. are, he finds, clear and distinct (not surprisingly, the very things required by his mechanistic physics). Any ideas which are obscure or confused cannot be relied upon, and as his paradigms of obscure and confused ideas he lists the qualities we perceive through our senses.

> ... things such as light, colors, sounds, scents, tastes, heat, cold and heat and the other tactile qualities, they are thought by me with so much obscurity and confusion that I do not even know if they are true or false, i.e. whether the ideas I form of these qualities are actually the ideas of real objects or not. [HR I, p. 164]

In the reply to Arnauld he describes such obscure and confused ideas as "materially false", by which he means that they provide the opportunity for error.

> ...the only reason why I call that idea [cold] materially false is because, since it is obscure and confused, I cannot decide whether it displays to me something outside my sensation or not...[HR II pp. 106-7]

If we can rely only upon our clear and distinct ideas to truly correspond to something real in the world, then all our ideas of qualitative features of the world are placed in a sort of limbo. We cannot know that they accurately inform us about the world, nor can we know that they don't. This leaves the field open for Descartes' physics to come in and explain what the world is like; the Meditations has prepared the way for his mechanistic physics, as he said it did in the introduction to the french edition of the Principles discussed above on page 73. Thus the mechanistic treatment of light and color to be discussed below, the rather more philosophical arguments of the first ten pages of Le Monde, discussed in the preceding section (which he explicitly presents as preparing the way for his physics), and the doctrine of clear and distinct ideas so central to his philosophy in general (which in fact prepares the way for his physics although the connection is not openly drawn), all converge in achieving the effect of driving a wedge between the qualities our senses disclose to us and the world as it is apart from us.

Having completed, now, our discussion of the historical context and the implications of Descartes'

victory over the Aristoteleans, we turn now to look more specifically at Descartes' account of light and color.

III.

DESCARTES THEORY OF LIGHT

Since vision is a sense which enables us to perceive what is at a distance from us, we must be able to explain how this is possible. In doing this, both Descartes and Aristotle reject the idea that objects send little copies of themselves, or that the eye emits some sort of visual rays,[17] and focus instead on the action of the medium between us and the object as the key to explaining our ability to perceive distant objects. Both light and color, then, are explained in terms of the intervening medium. The ways in which they explain the action of the medium, however, are completely different, with Descartes treating it in a wholly mechanical fashion, as opposed to Aristotle's more qualitative approach. As a result, Descartes winds up doing the very thing which Aristotle condemned Democritus for -- namely assimilating vision to

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17/ Descartes is not entirely consistent on this point, however, as he states that "the objects of sight can be felt [sentir], not only by the means of the action which, being in them, tends toward the eyes, but also by means of that which, being in the eyes, tends toward them. Furthermore, inasmuch as this action is nothing other than light; it must be noted that it is only those who see in the shadows of night, like cats, in whose eyes this is found; and that ordinary men only see by the action which comes from the objects." First Discourse of the Dioptrics [AT VI, p. 86, Olscamp p. 68.]

touch (although his way of assimilating vision to touch is different from that of Democritus).

The first thing to be considered is the all-important question of the nature of light. Aristotle, as we saw in Chapter I, denied that light was any sort of body or emission. He saw it as the act of the diaphanous medium caused by fire or a celestial body, that same diaphanous medium in its potential state being darkness.

> Light is as it were the proper color of what is transparent, and exists whenever the potentially transparent is excited to actuality by the influence of fire or something resembling the 'uppermost body'.
> DA 418a12-14.

Aristotle is clear that this is a qualitative change and not a local motion and that it occurs simultaneously throughout the whole diaphanous medium. He even refers to it once as the "soul" of the diaphanous medium. His account of light is, thus, inextricably bound up with the notions of act and potency, and of qualititative change. Since Descartes rejects these entirely, it is clear from the start that his theory will have to be very different from Aristotle's.

Descartes, in his attempt to produce a new, unified system of physics, gave considerable attention to light; his treatise on physics, Le Monde is subtitled "Treatise on Light". In this he develops an elaborate sort of fable -- a cosmological account of the origin of the world, the

development of the three elements, and an explanation of what light is based upon this theory. He is careful to present this theory as a fable -- an account of how things might have come to be,[18] at least partly because he realizes this theory conflicts with the Church's doctrine of creation.

In the Dioptrics, Descartes again returns to the subject of light, but this time does not claim to give us the real nature of light, but only to provide us with some useful models for explaining the observed behavior of light. Specifically, he offers us three different models, which will be discussed below: the blind man's stick, the vat of grapes, and the moving projectile model. Unfortunately these models are not entirely consistent with each other, and although the physics of Le Monde does seem to underlie them, the fit between the two works is sometimes rather loose. We shall begin our discussion of light with Le Monde since this work gives us the basic physics of light.

A. Le Monde

In order to understand Descartes' explanation of light, we need at least a rough grasp of his theory of the three elements, how they came to be, and how they are now arranged in the universe.

18/ AT XI, p. 31.

To start with, Descartes says, let us assume that God created the universe completely full of uniform matter, in particles of roughly equal size, and endowed them with motion -- turning about their own centers and moving also in circles around numerous centers, or vortices. Given only this, then, Descartes claims he can account for all the observed phenomena of nature -- a striking contrast with Aristotle's emphasis upon the qualitative differences between elements, and upon forms as being the specifying principle of things -- a role which must be played by motion for Descartes.

Since the particles have slight differences in their size and are differently situated with regard to the centers of the vortices, they eventually go through a series of mechanically produced changes such that they form the three major elements. The smallest and fastest moving particles wind up closer to the center of the vortices, the heaviest and slowest moving ones, being composed of irregular shaped particles, get stuck together and form solid bodies moving around the center, while the middle sized particles fill the spaces in between. Of the third element, the one which forms solid bodies, we need not say too much. It is described as the opaque element, since solid bodies reflect light, and all the objects we see are mainly composed of this element. The first and second

elements are those most involved in his explanation of light, so we will need to look at them in detail.

The first element is that of the smallest and fastest moving particles which have come to be concentrated at the center of the vortices. It is described as luminous and is found in its unmixed form in the sun and fixed stars. Fire, as we find it on earth, is a mixed form of the first element. He describes it as follows:

> In order not to be forced to admit any vacuum in nature, I will not attribute to it parts which have any determinate size or figure, but I am persuaded that the impetuosity of its motion is sufficient to cause it to be divided in all ways and senses by impact with other bodies and its parts change their shape at all moments to accomodate that of the places into which they enter. (AT XI, p. 24 Le Monde) (This and all other quotes from Le Monde are my own translations.)

It is not entirely clear here whether he is saying that the size and shape of these particles changes constantly, or that they have no determinate size and shape at all. If he means the latter it seems this would cause problems with a physics which purports to explain all the phenomena of nature in terms of the location, motion and shape of the small parts of matter. At any rate, it is the function of the first element to move rapidly about and fill up the gaps between the larger particles of the other two elements, so that no matter is wholly without some admixture of the first element.

The second element is composed of particles which are completely smooth and rounded, like pebbles on the beach, since all the rough edges have been broken off in the course of swirling around the vortices. (In fact it is the swirling motion of the second element which he relies on to explain the motion of the planets)[19/] They are carried in the swirling vortex like leaves in swirling water. Descartes compares the particles of this element to grains of sand and believes that although they are smooth and rounded, they are of determinate size and shape, and thus there are always tiny spaces between them to be filled up by the first element. The second element, then, is never without some of the first element, and this applies both to the heavens where we find the second element in its pure form, and the more gross and mixed form of the air which we find on earth.[20/] The second element is characterized as the transparent and fills the heavens as well as being the main component of air here on earth.

With a rough grasp, then, of the different elements, we are now in a position to be able to understand his account of light.

19/ See Scott, op. cit., p. 11.

20/ AT XI, p. 30.

Luminous bodies, such as the sun, are composed entirely of the pure first element. They are round, perfectly liquid and subtle.

> [They] turn without ceasing much faster and in the same direction as the particles of the second element which surround them [they] have the ability to increase the motion of those to which they are closest, and even to push them in all directions, and this by an action which I must soon explain as clearly as I can.(AT XI, p. 84)

This action, he then goes on to say, is what we call light. Light is, thus a kind of pressure, a tendency to move which is transmitted by the second element particles. This tendency, of course, involves no will or thought on the part of the particles, but is merely a disposition to move, which is present even though the surrounding bodies may prevent it from actually moving.[21]

In retreating away from the center around which they revolve, the second element particles tend away from the center along straight lines, just as a stone being whirled around in a sling does. This is the case because even though the second element particles are not all lined up in straight lines, they do touch each other. Thus the action

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21/ AT XI, p. 84. The next two paragraphs are also based on this section of Le Monde, pp. 84-97.

or pressure we call light is transmitted instantaneously over any distance.

The model, put simply, then, is that the luminous bodies push against the second element particles which in turn push against the second element particles which in turn push against our eyes in such a way as to cause us to have the sensation of light. Light, as it exists in the world, then, is a sort of pressure, action, tendency or inclination to move transmitted by the second element particles, and not a material thing. There is no actual movement, only the tendency. It is significant, however, that even in Le Monde he feels the need to bring in the model of the little moving balls when he tries to explain reflection and refraction and refers the reader to the Dioptrics for a fuller explanation.

B. La Dioptrique

Descartes' purpose in the Dioptrics, he tells us, is to discuss light only insofar as its rays enter the eye, are reflected and refracted by various bodies etc., and thus it is not necessary for him to undertake to tell us the real nature of light:

> ... it will suffice that I make use of two or three comparisons which help to conceive it in the manner which to me seems the most convenient to explain all those of its properties that experience acquaints us with, and to deduce afterwards all the others which cannot be so easily observed; imitating in this the astronomers, who, although their

> assumptions are almost all false or uncertain, nevertheless, because these assumptions refer to different observations which they have made, never cease to draw many very true and well-assured conclusions from them. (AT VI, p. 83, Olscamp 67)

Unfortunately, the three comparisons he gives are sketchy, and he does not appear to have thought out to what extent they are consistent with each other, or with the physics of Le Monde. In spite of this sketchy character, however, his account of light is very interesting and suggestive and was influential upon his contemporaries,[22] so let us examine his three comparisons or analogies.

1. The Blind Man's Stick

The first analogy given in the Dioptrics is the familiar analogy of a light ray with the stick a blind man uses to feel objects. This comparison was given in Le Monde[23] where the second element particles which touch each other play the part of the stick, although they are not actually joined together. Again, light is described as a kind of

> ... movement or action, very rapid and lively, which passes toward our eyes through the medium of the air and other transparent bodies. (Olscamp p. 67).

22/ Ronchi, op. cit., p. 113.

23/ AT XI, p. 99.

What is occurring is just like what occurs with the blind man's stick, where the movement or resistance of the bodies he touches with one end of his stick is transmitted instantly to the other end. The sun's rays, thus, extend from the sun to us in an instant.

His use of the stick analogy in the Dioptrics goes further than his use of it in Le Monde, in that he suggests it can also explain our perception of color. We perceive colors by means of light. In fact he actually suggests that

> ... colors are nothing else, in bodies that we call colored, than the diverse ways in which these bodies receive light and reflect it against our eyes. (Olsc. 67)

Our seeing different colors, then, is compared to the blind man's feeling the difference between mud, water and sand. These differences are perceived because of the ways the object moves, or resists the movements of the stick. From these rather hastily drawn comparisons, he proceeds to conclude that we have, on his view, then, no need to assume that anything material passes from the object to the eye, nor that anything in the objects is similar to the ideas or sensations we have of them, and to triumphantly announce that we are thus

> ... delivered from all those small images flitting through the air called 'intentional species' which have so troubled the minds of the philosophers. [AT VI, p. 87]

On closer examination, however, the picture is not as clear as Descartes would like us to believe. There are obvious disanalogies between light and the blind man's stick, as he himself notes a few sentences later, and it is not clear that he has fully abandonned the idea that there is some sort of emission from luminous bodies which travels to the eye. He speaks, for example, of objects "receiving and reflecting light". This latter point will become clear especially when we look at the third analogy he gives for light (see below).

Descartes himself notes the obvious disanalogies , and in attempting to resolve them he says some rather startling things. Looking at the next few sentences we are told that

> ... objects of sight can be felt, not only by means of the action which, being in them, tends towards the eyes, but also by means of that which, being in our eyes, tends toward them. [AT VI, p. 86]

This statement occurs in the context of trying to work out the disanalogies between light and stick, for inasmuch as he referred above to the "movement and resistance" of objects, it is clear that there can be no resistance unless the stick is pressed against the object instead of being wholly passive, and how can this be transposed to our account of vision? At this point he suggests that there can be a certain action proceeding from eye to object, as happens with cats who can see in the dark, although this does

not happen with "ordinary men".[24] Seeming to realize he is on thin ice here, he concedes that after all the analogy between air and the stick is imperfect, so we must make use of another comparison, and moves on to his second analogy.

2. The Vat of Grapes

The second comparison we are given for explaining what light is like, is illustrated in Figure III-1 (see page 169). The grapes, being pressed for wine are densely packed, but there is a fluid which fills in all the spaces between them. If a hole, A, is opened at the bottom, all of the parts of the wine tend immediately to descend towards A in straight lines. If two holes are opened, say A and B, the parts of the wine at D will tend toward both of these holes at the same time. The wine at E and C will also tend toward both holes, and the important thing here is that all these different lines of action do not interfere with each other even if they cross. Thus this analogy is more apt for explaining certain of the properties of light rays: if two sticks crossed they would obviously interfere with each other. The floating grapes do not interfere, even though, being supported by each other they do not tend to descend, and may even be moved in many ways by those who are pressing them. The parts of the wine at C

24/ AT VI, p. 86.

tend toward B in straight lines, although they cannot actually move in straight lines because of the grapes in between, and tend toward both A and B although they could not actually move in both directions at once. Light, also, must be taken as an "action" rather than an actual movement.

The general gist of what he is saying here is fairly clear. But if we try to relate it to the first analogy and to the physics of Le Monde, however, it is a bit hard to interpret. He compares the wine with the subtle fluid material which stretches from us to the stars, while the grapes are compared to the air or other transparent bodies.[25] This sounds like it is the wine which represents the first element, and all in all it is this interpretation which makes most sense of this whole section. It is the wine which is tending towards the holes in the bottom of the vat while the grapes simply float in it. But if we read him this way it seems inconsistent with the analogy in which the air was compared to the stick -- to that which transmits the action to our eyes. In Le Monde also it was the second element (or air) particles, which transmitted the action to our eyes.[26] Traite de l'Homme also

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25/ AT VI, p. 87.

26/ AT XI, p. 151.

contains the same view.[27] Instead attempting to reconcile these, Descartes instead moves on and presents us with a third analogy.

3. The Moving Projectile Model

The third model which Descartes introduces is in obvious tension with the previous two, and if accepted, would cause problems with the very difficulties which Descartes was so confident that he had resolved with his previous models. The vat of grapes analogy was helpful because it enabled him to explain how the rays can cross without interference. This was important to Descartes, as he says that one of the main accomplishments of the Dioptrics is to explain:

> ... how the rays from several different objects can enter together into the eye, or coming toward different eyes, can pass through the same place in the air without intermingling or preventing each other or being disturbed by the fluidity of the air or the agitation of the winds... how this does not prevent them [rays] from being exactly straight. (Table of the Principal Difficulties which are explained in the Dioptrics, AT VI, p.487)

The third analogy is brought in mainly to help him explain reflection and refraction. We are asked to think of light as being like little balls, or like a stream of little balls whose behavior can be explained by the same

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27/ AT XI, p. 151.

mechanical laws governing the behavior of moving projectiles. Just as a moving ball can lose its movement when it hits something soft, or be deflected by a hard surface, or aquire a spinning motion if it hits a rough surface, so also the light rays (now conceived of as streams of little moving balls) can lose their motion when they encounter certain surfaces (those we call black), or be reflected back in all directions (by those we call white) or aquire various spinning motions (which happens with bodies we call colored). Surfaces which are highly polished reflect the rays back without changing the order among the rays and thus can serve as mirrors. Just as a ball moving from air into water has its movement deflected, so light passing through different mediums is deflected. This model turns out to be very rich in theoretical and practical implications, and enables him to explain colors as well as reflection and refraction, as we shall see in more detail in the next section.

The problem, of course, is that this third model unlike the first two involves the actual movement of particles and not just a pressure or a tendency to move. This inconsistency is noted by many commentators. Scott, for example says:

> ...the parts of the subtle matter on that side of the sun which faces us tend to move in right lines toward our eyes without being hindered by the more solid particles. From

> this, argues Descartes, it is clear that nothing material passes from the luminous body to our eyes.
>
> But it is abundantly clear from his writings that Descartes was unable to abandon the emission theory and his explanation of the different properties of light and color is quite unintelligible upon any other assumption. (p.32)

Ronchi notes the inconsistency,[28] as does Alquie[29] who says that in order for a motion to be slowed down, turned aside, etc., it must be a movment actually realized and not just a tendency to move. And in this case, Alquie notes, all the difficulties which his theory had avoided (with crossing rays, etc.,) will reappear. Why don't the streams of little moving particles interfere with each other, get blown off course by the wind, etc.[30]

In order for the third model to be consistent with the first two, the inclination to move equated with light in the first two models must follow the same laws as actual movement of projectiles, an assumption Descartes explicitly makes in the Discourse on refraction (the second), but which is highly questionable.

Fermat, as we find in a letter to Mersenne, raised the objection that an inclination to move need not obey the

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28/ Ronchi, op. cit., p. 116.

29/ Oeuvres Philosophiques, Alquie (ed.), Vol. I, p. 659.

30/ Alquie, ibid.

same laws as an actual motion, but Descartes dismisses the objection, finding it clear and evident that it does, since whatever is in the act (movement) must be there in the potency.[31/]

Given Descartes' disclaimer that he does not try to explain the true nature of light (but rather that he offers comparisons to help us explain its behavior) and given mysterious nature of light which has baffled scientists to our own day, Descartes is perhaps to be forgiven if his theory is not completely consistently worked out. Let us therefore, at this point, quickly summarize his contributions and get an overview of the significance of his theory light before moving on to his theory of color. Several features of his theory deserve attention.

Summary: Light

First, his theory is consistently mechanistic uses no action at a distance, and no explanatory principles upon apart from things like figure, extension, number and motion. Thus his theory differs radically from Aristotle's account, with its reliance upon the concepts of act and

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31/ See letter to Mersenne, 5 October 1637, in Alquié, Vol. I, pp. 815-16. See also Wallace, op. cit., p. 262 and Scott, op. cit., p. 63 for discussion of how Descartes responded to Fermat's criticisms of his account of the matiere subtile involved in the transmission of light.

potency and its willingness to allow qualitative aspects of the world into physics.

Second, whether or not something material passes from the object to the eye, even the stream of little balls hypothesized on the third model is quite unlike the sort of resembling eidola hypothesized by the late scholastics. What is transmitted does not resemble the object.

And thirdly, all of his models treat light as something objective and physical out there in the world instead of just identifying light with our sensation as Malebranche or Berkeley do. Indeed, defending the immaterial and spiritual nature of light against the inroads of mechanistic materialism was one of Berkeley's main motivations in writing the New Theory of Vision. The real nature of light may remain mysterious to Descartes, but it is mysterious in the way in which it is mysterious to a physicist -- mysterious because it is not yet fully understood, but can become better understood through experiments and general growth of scientific knowledge. If light was simply identified with a sensation then presumably there would be nothing further to be discovered about its nature than what we know simply from having the experience of it.

IV.

DESCARTES' THEORY OF COLOR

Descartes' explanation of color in the Dioptrics and Meteorology was, perhaps, the most influential and important part of his theory of vision. He was especially proud of his explanation of the rainbow, and there is evidence from his correspondence[32] that he was writing a treatise on "the colors of the rainbow and certain other sublunar phenomena" in 1629 when he became inspired by the new vistas opening before him and laid it aside, resolving now to write a work explaining "all the phenomena of nature, that is to say the whole of physics."[33]

Aristotle, as we saw in Chapter I, regarded colors as really qualities of the objects. The diaphanous medium, when actualized by light, becomes actually transparent. It is then able to receive the forms of colors from the objects and transmit them to our eye -- a sort of second actualization of the medium which has already been actualized by fire or a celestial body to become transparent. Colors, which are proper sensibles, are not to be reduced to such common sensibles as shape or number

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32/ See Kemp-Smith, New Studies in the Philosophy of Descartes, p. 24.

33/ N. K. Smith, op. cit., p. 24. Crombie also believes that his work in vision was especially important to the genesis of his mechanism. "The Mechanistic Hypothesis and the Scientific Study of Vision ...", p. 67.

or motion. Mechanism, as discussed above, however, requires that Descartes do just this.

Our discussion of Descartes' theory of color will have two parts: 1) the physics of color, and 2) the more philosophical question of the nature of colors.

1. The Physics of Color

As we saw in our discussion of light, Descartes proposes three different, and at some points, inconsistent models for light. The key problem is that the first two models -- the blind man's stick and the vat of grapes, do not involve the actual movement of any particles of matter, while the third model does. It is clear Descartes wants to paper over this discrepancy, and he is constantly conjoining terms like "action or movement"[34] or "movement or tendency",[35] as though these were really the same. But his explanation of color really only makes sense in terms of the third model although he makes some attempts to relate it to the blind man's stick analogy.

The general principle involved in his explanation of color is quite simple. The little moving balls (which represent light) may travel in straight lines only, or they may also move around their own centers while they do so.

34/ AT VI, p 331.

35/ AT VI, p. 334.

Their spinning motion has a certain ratio to their forward motion, and it is this ratio which determines our sensations of color. When the spin of the particles greatly exceeds their forward motion then they generate our sensation of red, or yellow if the spin is a bit less. If the spin is less than the forward motion we see blue, and if it is much less we see green. The fact that certain bodies are consistently seen to be red or blue is accounted for by the fact that they cause the light particles which are moving in straight lines only, to spin also around their centers after being reflected off their surfaces, much as a tennis ball starts to spin when grazed by the racquet. This account of color clearly requires actual movement of particles for otherwise it makes no sense to speak of the movement of the particles "before" and "after" they are reflected from the surface of the object.

Our vision of color occurs, of course, only when the light rays focussed on our retinae cause motions in the optic nerve which are transmitted to the brain and occasion changes in the pineal gland by means of mechanisms which will be discussed in Chapter IV. He says:

> ... the movements in the areas of the brain where the small fibers of the optic nerves originate cause it [the mind] to perceive light; and the character of those movements cause it to have the perception of color. (Olscamp, p. 101)

Although Descartes, thus realizes that our perception of color occurs at the end of a long causal chain, this does not, I would suggest, settle completely the question of the nature of the colors seen. Let us, then, turn to consider this issue more carefully.

2. The Nature of Colors

Descartes has abandonned the Aristotelean assumption that colors are real qualities of the object -- proper objects of sight, not reducible to such common objects of sense as figure and motion.[36/] This much is clear. This leaves him several possible answers to the question 'what are colors?' He can identify colors with the structural properties of the surface of the object which cause it to reflect light as it does, or with the spinning motion of the light particles themselves, either of which choices allows them a certain existence independent of the perceiver. Or, he can take the idealist route and identify them simply with the sensations we have of them, as Malebranche and Berkeley did. On the basis of these early optical writings, however, we cannot clearly opt for any one of these to the exclusion of the others, since he seems inclined to assert all three at different times.

36/ See DA 418a 10-15 for claim that color is special object of vision, DSS 439b for view that objects partake of color, and for non-reducibility of proper sensibles to common sensibles, see DSS 442b.

The most realistic interpretation of colors can, perhaps, be put upon such passages as the following:

> ... the object V, which I suppose, for example to be red, that is to say that it is disposed to cause the little parts of this subtle matter, which have been pushed only in straight lines by luminous bodies, to move also around their centers after having come into contact with the object, and that their two movements have between them the proportion which is required to make us sense the color red. (AT VI, Disc.V p. 118)

The property in the object which we call color is picked out in terms of the sensation it causes in us, but Descartes does not appear to doubt that there is some physical property out there which causes the objects to reflect light in the way they do. After all, on his theory there could be no explanation for an object's disposition to reflect light in a particular way, other than the configuration and/or motion of the particles which make up that object. We can say, thus, that objects are colored in the sense that their surfaces have certain structural properties which account for the ways in which they reflect light, and although scientists have not yet adequately understood just what it is about the surfaces which accounts for their way of reflecting light, there are doubtless such properties and when we know them, then we will know what colors are.

This interpretation is confirmed also by many passages from his correspondence where he speaks of objects as

colored, and identifies colors with certain arrangements of the particles in the surfaces of objects. For example in a letter to Mersenne in 1638 he says that

> ... bodies which are perfectly polished at all points of their surface could have no other color than that of the objects which they reflect [AT II, p. 468]

In a letter to Regius he suggests that colors are to be identified with the configurations of particles in the surfaces of objects.

> When you treat of colors, I cannot see why you exclude blackness, since the other colors too are only modes. I would simply say 'blackness too is commonly counted as a color yet it is nothing but a certain arrangement, etc.' (Descartes' Philosophical Letters, edited by Kenny p. 103)

The explanation of color given above gives colors a reality independent of the perceiver to some extent. It is important that the red object is the one which imparts a particular motion to the little particles of matter which were previously moving only in straight lines. If the light particles had already had a spinning motion typical of, say, blue, then after being reflected off the red object ("red" in the sense defined above), they would not acquire the spin necessary to make us see red, but perhaps some average motion -- say purple. Nonetheless the object would still be red. Descartes does not explicitly discuss colors perceived under unusual lighting, but there is no

reason to think he would not go along with the above reasoning.

The situation, however, is more complicated. For we speak of colors in cases where there are no objects present. Light is often spoken of as colored, and there are phenomena like, e.g., the rainbow, which require additional explanation. In discussing these, Descartes tends to identify colors not with the dispositions of objects to cause the spinning motions of the particles, but with those motions themselves. This is, of course, natural in cases like the rainbow where there is no physical body reflecting the light. However, if colors are merely spinning motions of light particles then it would not be proper to speak of objects as colored. Descartes does, indeed, sometimes put forth this view of colors. In the sixth discourse of the Dioptrics he says of colors that "their nature consists only in diversity of movement"[37] and cites as evidence the fact that we see a flash of light when struck in the eye (even in a dark place), and the existence and behavior of after images (which change color as they fade). Also in line with this interpretation is a passage in Meteors where he says:

> ... the nature of the colors which appear towards F consists only in the fact that these parts of the subtle matter which transmit the action of light tend to turn with

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37/ AT VI, p. 132.

more force than they tend to move in a straight line." (AT Vol. VI, pp. 333-4)

On the basis of these passages, it seems Descartes might answer the question "what is color?" by saying it is a certain type of motion of the particles of the subtle matter which transmit light to us. If we take this as the central meaning of the term "color", then we can call objects "colored" as we did above, but only in a derivative sense -- namely that, because of the configuration and motion of their parts they impart these motions to white light when it is reflected off them. However, either of the definitions we have examined so far --i.e. 1) color is a disposition of a body (based on the configuration and motion of its parts) to impart a spinning motion to the particles of the subtle matter; or 2) color is itself this spinning motion -- do preserve a sort of objectivity for colors which is more in the spirit of the materialist scientist than it is in line with the way later philosophers treated color on the basis of the primary/secondary quality distinction.

There are, however, passages where Descartes sounds closer to an idealist position on the nature of color, the most important of which occur in the Meteors in the section on the rainbow. He speaks there of the spinning motions of the light particles, saying: "those which have a much stronger tendency to rotate cause the color red and those

which have only a slightly stronger tendency cause yellow."[38] This would prevent us from equating colors with the motions of the light particles, but rather leads us to see these as only causes of the colors which, then, are to be identified with the sensations caused by the spinning light particles.[39]

He also says:

> I do not care for the distinction of the philosophers when they distinguish between real colors and false or apparent ones. For since all their real nature is that they appear, it seems to me a contradiction to say that they are false and that they appear. But I admit that shadow and refraction are not always necessary to produce them, and that the parts of bodies called colored can interact with the light to increase or decrease the spinning of these parts of the subtle parts of matter. (Olsc. 338-9 AT VI, p. 335)

This passage might seem to be consistent with the view that colors are to be identified with the spinning motions of the light particles; wherever we have that, we have color regardless of whether this spinning motion was caused by refraction (as in the case of the rainbow) or by the reflection of light from an object. Since he is taking the rainbow as a paradigm case of color perception, and treating our more ordinary perception of objects as a special case, it is not surprising that he would tend to see color

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38/ AT VI, p. 333.

39/ Olscamp, p. 337.

as being somehow in the light particles. Thus he speaks of objects "called" colored, causing doubt about whether the objects really are colored.

There are, however, hints of a deeper idealism in this passage. The statement that "all their real nature is to appear" certainly seems to make of colors something subjective. An "appearance" after all must be an appearance to someone. Colors cannot be identified with the spinning motion of the light particles if "all their real nature is to appear," since without a perceiver there is no appearance. He also seems to be identifying colors with that appearance to the perceiver in saying that they cannot appear and be false. If this is so, it would seem that after images, the yellow color seen by the jaundiced man, etc. would be all true, and indeed, that all talk of our color perceptions being true or false at all would be ruled out.

Surely one of the underlying reasons why Descartes has trouble here with distinguishing false and true perceptions of color, is because he supposes that for our perceptual idea of red to be true, there would have to be something exactly like our idea out there in the world, and the possibility of this is precluded by his committment to mechanism. His difficulties here, then, can be seen as a natural result of the gap which his mechanism created between the world as we experience it, and the world as

science tells us it is (discussed above in Part III, section C). And passages like these from the Meteors thus serve to illustrate the way in which the driving of the wedge between our experience and objects leads toward subjectivization of colors.

If, however, we step back and look at the early writings we have been discussing in this chapter as a whole, we find that Descartes does not consistently take this subjective view of colors, as Malebranche and Berkeley were to do, although that can be seen as a logical outgrowth of his theory. Rather, with the instinctive realism of a scientist he applies color terms all along the causal chain -- to objects and to light as well as to our sensations.

Whether or not he is entitled to do this is not a completely settled question. He could, perhaps, do so legitimately if he treated the application of color terms to objects, light and our sensations as a case of analogical predication, and distinguished carefully the differing ways in which color terms apply along the causal chain. Even an acknowledgment that color terms apply ambiguously to our sensations and to the contributing causes of those sensations, would go part way toward clarifying the problem. But he fails to do this, writing as though color terms apply univocally all along the causal chain, and this left his successors the problem of trying to be more precise about

the nature of colors, and to clear up the ambiguity in his account of color.

SUMMARY/CONCLUSION

In this chapter we have examined the way in which Descartes developed a consistently mechanistic account of the objects of vision -- light and color. His system is mechanistic both in terms of the type of explanations of natural phenomena he will accept and in terms of what his metaphysics supposes to be the real nature of the physical world.

The significance of this sort of mechanistic explanation of light and color has been discussed in terms of the sort of struggle going on in Descartes' time between Aristotelean and mechanistic science. It has been shown that for a number of reasons Descartes' mechanization of light and color was important to the general victory of mechanism, and that this victory had the effect of driving a wedge between light and colors as we experience them and light and colors as they are in the world (an effect also accomplished in a different way by his use of the doctrine of clear and distinct ideas to discredit all our ideas of the qualities which our senses reveal to us).

In Le Monde he postulates three major elements and explains light as a sort of pressure which is caused by the first element particles pressing against the second element

particles which communicate this pressure to our eyes as a stick when pushed at one end communicates that pressure to the other end instantaneously. The Dioptrics offers us three models for understanding light which are not wholly consistent with each other. It is the third model, that of the moving projectile, which he relies upon in his explanation of color which traces our perception of color to the ratio between the spinning motion of these small particles and their forward motion.

This mechanization of light and color forms a necessary basis for his mechanization of the rest of the perceptual process to be discussed in the next chapter. This is the case first of all because mechanical explanations require action by contact only and thus his account of light forms the necessary basis for any such explanation, enabling him to reduce vision to a form of touch. And furthermore his explanation of colors in terms of motions will be essential to the whole process of transmission of the retinal image to the pineal gland. Having thoroughly banished the Aristotelean notions of act and potency, forms and qualities from his account of the objects of vision, he is now in a position to explain the rest of the process of vision mechanistically, as he would not be as long as any part of the Aristotelean account of the objects of vision still lingered.

In the next chapter we will move on to consider the way in which Descartes explains what occurs within the perceiver -- eye, nerves, animal spirits, pineal gland, etc. It is in explaining these that some of the problems which we uncovered in our discussion of the Rules in Chapter II, really come to a head. His understanding of the role of the retinal image in vision and his hypotheses about the physiology of vision generate some real problems for him with the emergence of a little resembling image of the object, as it were, presented to the soul at the pineal gland. He disassociates himself from the theory of perception by means of resembling images, but his replacement of the Aristotelean notion of form with that of figure makes it difficult for him to wholly free himself from it. In his explanation of spatial perception especially, there is a real tendency to introduce a sort of inner image or object of perception.

This view that our visual perception does not give us direct access to physical objects but only to some sort of inner image or copy of the object, was an important stepping stone on the road to visual idealism. It cannot be adequately treated at this point because we must first work through the material to be presented in the next chapter. However, it is worth noting that his treatment of light and color does have bearing on this issue, and that while

certain elements of his theory of light and color tend to push him in the direction of seeing our perception of physical objects as direct, others tend more toward the view that we perceive directly only an inner image or copy.

The analogy between light rays and the blind man's stick tends more toward the view that that our perception of physical objects is direct. Just as we would say that the blind man is feeling the object itself and not some copy or image of it, so, Descartes would like to say, we feel the objects by means of the light rays with our eyes. To the extent, however, that he relies upon the moving projectile model (as he does to explain colors), our contact with the object would be far less direct. Particles would take some time to travel, could be disturbed by winds or all sorts of intervening things, and thus being bombarded by a stream of particles originating at the object would be less plausibly viewed as a direct contact with the object. This is probably why Descartes clings so tenaciously to the stick analogy in spite of its dubious compatibility with the projectile model needed to explain colors.

His mechanistic treatment of color, on the other hand, tends to push him away from any very straightforward direct realism about vision. If what our senses reveal to us -- namely a world full of colored objects -- is so radically

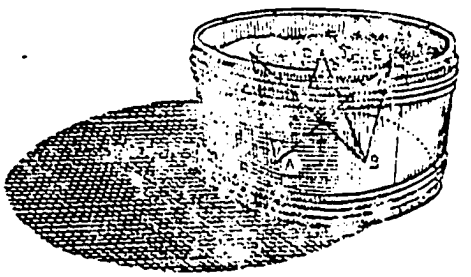
different from what mechanistic science tells us the world is really like, then our sense experience cannot be trusted to accurately inform us about what the world is like. It must, then, be merely informing us about something purely subjective; our sensations or ideas become, as Berkeley put it, "terminated within themselves" (NTV section 79). Our mind reaches only as far as our own ideas or sensations and then stops because there is no natural connection between the qualities we experience and anything outside us.

Since our sensations differ so totally from what science tells us is real, explaining the causal connection between them becomes very difficult. How can extension, figure and motion cause our sensations of color, for example? It is interesting that Descartes, Malebranche and Berkeley all bring in God to bridge this gap. Descartes falls back upon the act of God who just connected our mind and body so that we would have certain sensations on the occasion of certain motions. Malebranche supposes that God intervenes constantly to give us certain sensations when our bodies are acted on in certain ways, and Berkeley hypothesizes that God simply gives us all our ideas in a regular order.

We turn now to consider these issues in greater depth within the context of Descartes' mechanistic explanation of the rest of the process of perception.

FIGURES

Figure III-1



CHAPTER IV
DESCARTES' THEORY OF VISION: PART II
THE PROCESSES OCCURRING WITHIN THE PERCEIVER

INTRODUCTION

In the Rules Descartes provided a rather hastily drawn outline of the process of perception. For the reasons discussed at the end of Chapter II, it was very important for the success of Descartes' ambitions to overthrow the scholastics that he be able to provide a satisfactory explanation of perception, and especially of our perception of the qualitative aspects of the world, according to his mechanistic principles. His account of perception in l'Homme and La Dioptrique, then, can be seen as his attempt to expand on the account given in the Rules and to spell out more concretely how the figures of objects are impressed upon the external senses and transmitted inward to the soul at the pineal gland, giving special attention to our perception of particular qualities such as heat, cold, savors, colors, etc.

His mechanistic treatment of light and colors which we discussed in the preceding chapter eliminated the scholastic real qualities and substantial forms, and thus laid the groundwork for a similar mechanization of that part of the perceptual process which occurs within the perceiver. The analysis of color in terms of the motion of particles, in particular, makes possible a more sophisticated theory of

color perception than that found in the Rules, where he merely remarked that differences between colors were like the differences between different figures.[1/] Explaining colors in terms of motion as well as figure also makes it easier to explain the transmission of colors from eye to brain.

The greater sophistication and scientific detail of L'Homme and La Dioptrique, however, does not result in the solution of all the problems left unsolved by the account of perception in Rule XII. There was in the Rules, as we discussed in Chapter II, a real difficulty in explaining the interaction of the imagination (conceived to be corporeal) and the cognitive power (thought of as purely incorporeal), and a latent danger that the ideas/images impressed upon the imagination might emerge as some sort of third thing between the mind and the world. Perhaps partly in an attempt to avoid this problem, l'Homme and La Dioptrique eliminate the faculty psychology which still lingered in the Rules; the common sense and the imagination are telescoped together and hypothesized to be located at the pineal gland, and thus the mind does not confront the imagination as an object.

It is not clear, however, that this has really solved the problem. Whether the mind confronts a semi-independent

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1/ Rule XII, HR I, p. 37.

imagination, scrutinizes the patterns of open and closed tubules in the cerebral cavities, or contemplates the patterns traced by departing animal spirits in the surface of the pineal gland, he must still wrestle with the problem of the mind confronting something material. If anything, it seems that the increasingly sophisticated mechanization of the whole perceptual process up to the surface of the pineal gland (as opposed to the older faculty psychology which allowed the imagination some independent and quasi-mental functions) makes the mind/matter polarization sharper and the problem of their interaction harder to resolve.[2/] The danger of a third entity emerging between mind and world -- a little inner object of perception -- has not really been averted; it has merely taken a slightly different form.

In spite of the many problems inherent in Descartes' explanation of perception in l'Homme and La Dioptrique, his theory of perception is extremely important and has exerted a tremendous influence upon subsequent philosophy of perception. It would not be an exageration to say that Descartes set up the philosophical framework within which his successors discussed perception -- a framework which

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2/ The metaphysical assumptions which underlie the problem of mind/body interaction will be briefly touched upon in Part IV below.

made possible the rise of a sort of perceptual idealism which would have been unthinkable within the older Aristotelean framework. It will be the main purpose of this chapter, then, to come to a deeper understanding of the new framework Descartes set up for explaining perception, some of the key ways in which this departed from that of Aristotle, and some of the tensions and unresolved problems inherent in this new framework.

In particular, it will be argued that both the more philosophical changes Descartes has made in the traditional framework, and his physiological hypotheses (which are, it will be argued, partially guided by philosophical considerations) set up a pressure or tendency to see our perception of external objects as indirect, and to suppose that there is some sort of inner object of perception. Descartes, himself, does not come out and say that we do not directly perceive physical objects, or that we perceive only some little inner copy of them, but these views are implicit in much that he does say. His own instinctive realism, his belief that light is a real physical thing exerting pressure on the eye, and his belief in the causal interaction of mind and body and their quasi-substantial union, save him from the purely idealist form of representationalism such as we find in Malebranche and Berkeley which claims that all we ever directly perceive are our ideas. However,

the changes he has made make it impossible for the traditional account of perception to work, and necessitate a thorough re-thinking of perception. A gap has been generated between the perceiver and the world which it will be, from this point on, quite difficult to bridge.

In the first part of this chapter we shall consider some of the problems generated by Descartes' philosophical changes in the Aristotelean framework -- the abolition of the hylemorphic theory, of matter/form and act/potency. These made it very difficult to explain how the soul and body can work together in perception and contributed to the problems with the emergence of a little inner object of perception.

In the second part we will examine Descartes' physiological hypotheses, both in terms of what was valuable and new in them, and in terms of the problems they engendered.

In Part III we shall look at the way Descartes, relying upon the mechanisms described in Part II, goes on to explain our perception of light, color, situation, distance, size and shape, which he says are the main qualities we can perceive in objects of sight. Special attention will be paid to the differences between the ways he explains light and color on the one hand, and situation, distance size and shape on the other. It will generally be argued that although there clearly is a difference between

his explanation of light and color perception and the way he accounts for our perception of the other attributes of objects, the difference, at least in the optical writings, is by no means as clear cut as some critics would have us believe. Just as Descartes' treatment of light and color prepared the way for the complete subjectivization of them without himself going quite that far (in the optical writings at least), so also his treatment of our perception of those qualities which essentially involves spatial perception prepares the way for the view that perception of them all necessarily involves judgment.

In Part IV we will discuss what the main problems left outstanding by Descartes' theory of vision were. We shall also touch briefly on some of the reasons why Descartes, himself, failed to appreciate their severity.

PART I:
GOALS AND ASSUMPTIONS OF DESCARTES THEORY OF VISION AS CONTRASTED WITH ARISTOTLE

A great deal has already been said about the way in which Descartes has departed from the assumptions shared by those within the Aristotelean tradition. We need not recapitulate all this material, but it will be helpful to summarize some of the essential differences as they bear upon the way we understand the processes of vision which occur within the perceiver.

On the most obvious level, there are differences which result from Descartes' greater scientific knowledge. Unlike Aristotle, Descartes correctly understood the structure and function of the eye, the role of the nervous system, and the fact that the brain and not the heart is the central coordinating organ for perception. These changes are, of course, important and give Descartes' theory a very different shape from Aristotle's. However these differences are not the only important ones, and Aristotle would have had no trouble accepting them had he been presented with the facts Descartes knew.

Rather it was some of the other changes which Descartes made in the Aristotelean framework which were particularly important in creating the problems which led to the rise of perceptual idealism. The most basic one, as we have seen, was Descartes' committment to a metaphysics

which admits only those entities consistent with mechanistic science -- e.g. figure, number, extension and motion. From this flowed his rejection of those keystones of Aristotelean metaphysics, matter and form, act and potency, and his replacement of the hylemorphic theory that the soul is the act or form of the body as a whole with the "real distinction" of mind and body. Taken together, these changes have had a revolutionary effect upon subsequent philosophy of perception.

Soul and Body:

Aristotle, as we saw in Chapter I, regarded perception as the act of the soul/body composite. There could not be, for him, a number of changes occurring in the body which were identical in nature to those which would occur in an inanimate object, followed at some point by an act of the soul, or its suddenly being acted upon. It is qua informed by a sensitive soul that the animal is able to sense,[3/] but the entire process from the retina onward is an act of the whole composite or knower. He could never say, as Descartes did, that it is the soul is completely distinct

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3/ See, for example DA 413b 10-13, where having just been describing the nutritive and sensitive powers, he says "the soul is the source of these phenomena" [Smith trans.], and DA 414a 12-15 "it is the soul by with or with which primarily we live, perceive and think." Also "All natural bodies are instruments of the soul ... they exist as for the sake of the soul. ... nothing senses unless it has a soul." DA 415b 15-25.

from everything corporeal[4/] or that it is the soul which perceives and not the body.[5/]

Having so sharply separated soul and body, Descartes has several difficulties which Aristotle did not.

First of all, he faces the problem of how to connect the soul with the body. Since, according to Aristotle, the soul is separable from the body only by an act of abstraction, he did not have any difficulty with how my soul is attached to my body. Descartes, in his attempt to explain this, hypothesizes that it is joined to the body and interacts with the body primarily (and in perception, almost exclusively) at the pineal gland. This spatial localization of the mind or soul tends to make us think in terms of "in here" (where the soul is) and "out there" (the world) -- to remove the soul from direct contact with the world and banish it to the inner recesses of the brain.

Secondly, not only is the soul localized at the pineal gland, but it is a separate substance, completely distinct from everything corporeal and thus confronting the brain as an object. It is true that we do not experience our brain

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4/ See Rule XII, HR I, p. 38 "... that power by which we are properly said to know things, is purely spiritual, and not less distinct from every part of the body than blood from bone or hand from eye."

5/ In the fourth discourse of the Dioptrics, Descartes says that "It is the soul which senses and not the body." AT VI, p. 109.

or the motions in it, as an angel would if it were to find itself in our body.[6] Instead we experience the sensations which God has joined to the motions in our brain. But regardless of how we experience what is going on, what is occurring on a metaphysical level is that the soul is confronted by and acted upon by motions in the brain. Thus he can say in Traité de l'Homme that the patterns traced in the pineal gland by the departing animal spirits are, "the forms or images which the reasonable soul considers immediately, when, united to this machine, she imagines or senses some object."[7]

And thirdly, since Descartes has so sharply separated soul and body, he has difficulty explaining how they can work together, as they must in perception. Aristotle provided one account of perception which integrated the functions of soul and body. Descartes, instead, employs two separate models. On the one hand he wants to provide a completely mechanistic account of perception which will explain our perceptual abilities wholly by reference to anatomical structures and mechanically specifiable changes in the body (the mechanical model). When he is unable to explain something this way, as for example he is unable to

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6/ Kenny, (ed.) Letters, p. 128.

7/ AT XI, p. 176.

explain our visual perception of size and shape mechanistically, he falls back upon what I will call the homunculus model. He then describes the soul as if it were a little inner judge who compares, estimates, directs his attention to this or that, and makes a variety of judgments and calculations. Our ability to perceive size, for example, is then explained by reference to these judgments.

The existence of these two different models raises a number of interesting questions, which Descartes unfortunately fails to address. How are we to tell when we should employ one model rather than the other? Are some types of perceptual abilities wholly explainable by only one of the models, or are they both operative in all perception? If they are both operative, how can the soul be, at the same time, wholly passive (as it is on the mechanical model) and actively involved in reasoning and judging (as it is on the homunculus model)? Is there any reason, in principle, why we must retain the homunculus model, or could it be dispensed with as our mechanistic explanations become increasingly sophisticated. Descartes gives no indication that he is aware of using two models, and thus does not attempt to answer these questions.

What is most important for our purposes, however, is the fact that the homunculus model strongly reinforces the tendency to regard the soul as a separate, brain-imprisoned

thing which confronts the brain as an object. If the soul is to correct for the defects in the retinal image it must be able to perceive the retinal image, and thus the retinal image, or its brain correlate, emerges as an inner object of vision, as we shall see below in Part III.

Matter/Form

The traditional matter/form distinction provided a conceptual framework for understanding the mysterious interweaving of subject and object in perception. Forms, being an immaterial or spiritual principle inhering in things, making the tree, for example, be a tree, they could also inform the sense faculty and ultimately the intellect of the perceiver, enabling him to know the tree. They thus served as a kind of bridge connecting knower and known; that very form which makes the tree be a tree can inform my mind enabling me to know it. There was no need, within the Aristotelean/Thomistic framework, to suppose that there was any sort of literal physical resemblance between some state of the perceiver and the object. Any physical change could, in principle, enable the sense faculty to take on the form of the object, for the form exists in the knower in a different way than it does in the object.

In place of forms, Descartss has substituted "figure", as we saw already in Rule XII and will see further below. His physiological hypotheses specifically provide for the

transmission of the figure impressed upon the retina to the soul at the pineal gland. This, however, poses problems in several regards. First, the figures traced in the pineal gland are purely material in nature and as such cannot, as it were, pass over into the mind as forms could, and thus cannot serve as a bridge between the perceiver and the object.[8] Secondly, these figures began to emerge as little inner objects of perception, as will become apparent below in our discussion of spatial perception. And thirdly, since it is by means of the transmission of figures to the pineal gland that we are enabled to know them, it is necessary that the figure traced on the pineal gland resemble (albeit imperfectly) that of the object. This causes problems for Descartes, since he wants very much to dissociate himself from the view that we perceive things by means of little resembling images.[9]

8/ Thus Aristotle can say of the stone's relation to the soul "no stone is in the soul, but only its form." DA 431b, 28-29. It seems that this lack of forms is the main reason why Descartes was never able to develop a theory of sensory abstraction along the traditional lines.

9/ "We must," he says, "be careful not to suppose that in order to sense, the soul needs to comtemplate any images which are sent by the objects to our brain, as our philosophers commonly do; ..." It is clear from the ensuing discussion, however, that he is here combatting the rather decadent late scholastic view of species which resembled the Epicurean eidola more than the Aristotelean/Thomistic species. He himself goes on (Continued next page)

Act/Potency

The act/potency distinction was also very central to Aristotle's understanding of sensation, and served a number of important functions. Having done away with it, Descartes must develop alternative ways of explaining those aspects of perception whose explanation had traditionally involved the act/potency distinction.

For one thing, the view that each sense is in potency relative to its own proper object explains why we see colors when the eyes are stimulated, and hear sounds when the ears are stimulated, etc. Since, according to Descartes, all the senses alike are passively moved by the figure and motion of their objects, he needs to explain why the movements of some nerves cause us to see colors, while others cause us to hear sounds. This he can only explain by supposing that God joined the motions of particular nerves or parts of our brain to particular sensations.

Another function of the act/potency distinction was that it provided an account of the way in which the perceiver is both active and passive in perception. The sense faculty, in itself, is mere potency which must be

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9/ to re-introduce resembling images of a certain sort -- albeit only imperfectly resembling -- when he supposes that the images the objects send to our brains resemble them only imperfectly as a caricature or perspective drawing does its object.

actualized by something already in act. When the sense object acts in the perceiver, it actuates the sense faculty in such a way that it takes on the form of the object, and the act of the sense and the act of the object are said to be one and the same.[10/]

Descartes, having replaced potency with passivity, has reduced the role of the sense in perception to that of merely receiving changes in the configuration and/or motion of the sense organ, and passing motions or patterns of motions along the nerves to the brain in the same way a stick or piece of string would. The function of the entire body is, thus, a wholly passive one and, to the extent that he wishes to bring in any sort of active role for the perceiver, he has to have some recourse to the homunculus model. And as a result of all the other changes he has made in the Aristotlean framework, Descartes employs the homunculus model in a way which hypothesizes that the soul corrects for defects in the retinal image. Thus the soul must have access to that image or its brain correlate.

And finally, the act/potency distinction within the Aristotelean tradition functioned to place any discussion of perception within a context including both perceiver and

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10/ DA 426a15-18: "the act of the sense object and of the sense faculty is one and the same (though each has its own being)." [Moerbecke trans.]

object, since sensation is the actualization of a potency by something already in act. The perceiver and the object perceived are thus closely interwoven, as the object is really present in the perceiver through its act, the act of the object and that of the sense faculty being one and the same.

This approach to perception stands in sharp contrast to Descartes' approach in the Meditations where he takes his own state of consciousness as a starting point, placing the existence of the objects of sense in doubt. The contrast with the Dioptrics and l'Homme, however, is less sharp, since Descartes, in these works, discusses perception within a realistic context starting with both the perceiver and the object known and trying to explain their interaction. However, since Descartes has replaced potency with the sort of passivity which a stick or a piece of string might have, the soul may experience motions caused by the object, but he cannot say, as Aristotle did, that the sense object is present in the perceiver through its act.

Summary

Thus, as we have seen, Descartes' changes in the Aristotelean metaphysical framework set up a dynamic which generated a gap between the soul and everything material, and the concepts he substituted for the traditional ones

exerted a pressure toward postulating an inner object of perception.

The real distinction of mind and body resulted in external objects and my body both becoming wholly separate from and external to the mind. The spatial localization of the soul at the pineal gland exacerbated the problem, creating as it did a kind of "in here" vs. "out there" way of thinking about perception. Since the soul and the body were, on his view, completely distinct, he employs two different models for explaining perception -- the homunculus model when focussing on the role played by the soul and the mechanical model when focussing on the role of the body -- in place of one model which integrated the functions of both (as we found in Aristotle).

His rejection of the form/matter distinction left him without those forms which had traditionally provided a bridge between knower and known, and in addition entangled him in the problems of perception by means of resembling images, since his own mechanistic substitute for the traditional account must include the transmission of those very figures impressed upon the retina to the soul at the pineal gland.

His replacement of the Aristotelean concept of potency with passivity made it necessary for him to find another way of explaining why we perceive different sensations by

means of our different senses, and destroyed the sort of unity between perceiver and object which Aristotle had postulated in saying that the object is present in the perceiver by its act, and that the act of the sense and the act of the object are the same. Since the body was seen as wholly passive in perception, any activity must be ascribed to the soul, and was described in terms of the homunculus model. In the light of all the other changes he has made, his reliance on the homunculus model strengthens the tendency to postulate an inner object of perception on which the soul bases its calculations and judgments.

PART II:

THE MECHANICS OF VISION: DESCARTES' PHYSIOLOGY

A. The Retinal Image

Descartes, unlike Aristotle, was heir to the whole medieval anatomical and optical traditions. With Felix Platter's work, the anatomy of the eye and the function of the retina had been correctly understood and Kepler, building upon Platter's work, and upon his knowledge of mathematical optics, had at last come up with the correct explanation of the formation of the retinal image.[11/] Thus, while Aristotle, having virtually no knowledge of the optical properties of the eye or the existence and function of the retina, supposed that it was the watery part of the eye which received the forms of colors and conveyed them inward through the optic channels to the brain and from thence to the heart, Descartes could develop a theory of vision starting from the retinal image.

In many ways, the retinal image seems to be just what Descartes needs to make his theory of vision work. It provides a wonderful example of how the figure of the object is impressed upon the external sense, as he said it was in the Rules. According to Kepler's account, the rays from each point of the object are re-united (due to the

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11/ Lindberg, Theories of Vision from Al-Kindi to Kepler pp. 193-202, Polyak The Vertebrate Visual System pp. 35-36

refractive power of the lens) at a corresponding point on the retina, there tracing a reversed and inverted image of the object. Since, as we saw in Chapter III, colors are caused by, if not actually identified with certain motions of the light particles, the light rays will impart those motions to the retina, thus tracing upon it the figure and color of the object seen in a way which could be seen as analogous to the way the seal impresses a pattern on the wax. Thus a sort of mechanistic analogue has been provided for the Aristotelean notion of the sense receiving the forms or qualities of the object. As he put it in Rule XII:

> The first opaque structure in the eye receives the figure impressed upon it by the light with its various colors. (HR I p. 37)

Descartes' account of the retinal image appears in the fifth discourse of the Dioptrics.[12/] Although it adds nothing to the theory developed by Kepler, it does raise some interesting philosophical issues. In order to convince the reader that a picture of the objects we see (french "peinture") is printed (imprime) upon the back of the eye, Descartes describes an experiment which he, himself, had performed.

He instructs the reader to take the eye of a cow or a newly dead man and remove the back surface or retina

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12/ The following account is based on AT VI pp. 114-130, Olscamp pp. 91-100. Translations my own.

leaving the rest of the eye as undisturbed as possible. Place a piece of opaque paper or egg shell behind it and put the eye in the hole of a specially made window which looks out on a brightly illuminated scene. You will then see appear on the paper a picture which represents all the objects in perspective (it must be dark in the room except for the light entering through the eye).

The attached diagram [See Fig. IV-1 on page 256] illustrates the experiment, complete with the dark chamber and the man inside. Light travels from objects V, X and Y, the light from each object being brought to a focus at a point on the opaque sheet of paper. If the light being reflected by object X is yellow, then as it shines through the paper it will cause us to see yellow at point S, if V is reflecting blue light, we will see blue at point R, and so also for Y (say it is red) and T. Thus what appears on the paper will have the same colors in the same order as V, X and Y, thus resembling them.

Although this little picture can be perfectly formed if all the conditions are right (the relevant conditions involve things like the shape of the lens, its distance from the retina, the width of the pupil, etc.), it nonetheless has certain imperfections. The principal one is that due to the way the eye is constructed only those things brought to a focus near the center of the retina are

seen clearly, while those toward the edges are very indistinct, since the rays aren't brought accurately to a focus. Thus the picture is only clear in the middle (we are, it should be remembered, still talking in terms of the man in the dark room looking at the back of the dissected eye).

As for the other imperfections of the painting, they are that:

> ... its parts are reversed, that is to say in a position completely contrary to that of the objects; and ... they (the parts) are elongated and shortened some more, some less, because of the differing distance and situation of the things which they represent, in the same way as in a perspective painting. [AT VI 123-4, Olscamp pp. 96-97]

A small close object occupies as much space as a larger more distant one, and a straight line VXY is represented by a curved line RST, due to the curvature of the eye.

This explanation of the retinal image and its manner of formation is indeed a convincing one, as the experiment is dramatic and easily visualizable. However, introducing the retinal image in this way could easily mislead an unwary reader into supposing that in vision the soul, like the man in the dark room, somehow gazes upon the pictures painted on the bottom of the eye -- a view which would obviously lead to a viscious regress, since another eye will be needed with which to see the picture. The light rays may move the points on the retina, but no "picture"

appears until the causal chain is broken, the retina replaced by an opaque white body and another eye introduced.

Descartes himself is too sophisticated to fall into this error[13] -- or at least not without a struggle. His struggle is already evident here in his discussion of the retinal image, as he prefaces his discussion of it with the comment that although the soul has no need to contemplate images resembling the objects, nonetheless it is true that there are such images imprinted on the retina.[14] The resembling images are thus almost an embarrassment to him, but this does not prevent him from relying upon them in his explanation of vision.

B. Transmission of Retinal Image to Pineal Gland

Our account of vision cannot end with the image on the retina; the soul was believed by Descartes to have its seat deep within the brain, and thus the images must be

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13/ For example at the start of the 6th Discourse of the Dioptrics he says that "while this picture (peinture), in passing thus into the inside of our head, always retains some resemblance to the objects from which it proceeds, we must nonetheless not be persuaded that it is by means of this resemblance that it enables us to sense them, as if there were yet other eyes within our brain with which we could perceive it [ambiguous referrent picture or resemblance [AT VI, p. 130]

14/ He says "You see thus that although the soul has no need to contemplate any images which are similar to the things it senses, this does not prevent it from being true that the objects we look at imprint quite perfect ones [images] in the bottoms of our eyes." AT VI,, p. 114.

transmitted beyond the retina. Optics, as Kepler had pointed out, cannot help us here, since light cannot penetrate beyond the opaque surface of the retina, the path of the optic nerves being crooked, and passing through dark places.[15/] We must, Kepler said, leave it the the physicists or natural philosophers[16/] to explain what happens between retina and soul -- whether the soul comes down to meet the images, or they are somehow transmitted to the seat of the soul or visive faculty.

It is at this point that Descartes introduces what is perhaps his most important contribution to the theory of vision, the point for point projection of the retinal image to the brain. Polyak, in his encyclopedic work The Vertebrate Visual System summarizes Descartes' contribution as follows:

> ... Descartes tried to explain mechanically, by anatomical structures, not only a "point-to-point" transmission of each monocular retinal image upon its own area of the brain but also an orderly formation of a single cerebral mental image made up of "corresponding retinal points," united according to their functional values and arranged topographically in space to reproduce an accurate cerebral copy of the observed visual object. [Polyak p. 103]

15/ Crombie, "The Mechanistic Hypothesis and the Scientific Study of Vision: Some Optical Ideas as a Background to the Invention of the Microscope," p. 58

16/ Kepler's text is cited by Lindberg, p. 203, and Crombie, pp. 58-59.

The mechanics of the way in which the retinal image is transmitted involve, first of all, the nerves, so a rudimentary understanding of his theory of neural function is needed. Each nerve, he tells us, has three parts: 1) the outer sheath, which is like a hollow tube; 2) the thread-like fibers which extend unbroken from the body part to the brain, and 3) the animal spirits which flow through the tubes keeping them inflated so they do not pinch the little threads. Each nerve serves both sensory and motor functions. (A theory disproved by modern science.) The little fibers convey motions to the brain, just as when we pull one end of a string it moves the other end, or when we push one end of a stick the other is moved.[17] And the animal spirits flowing from the brain to the body parts cause the muscles to contract or relax and thus cause movement. The animal spirits are very fine particles, of the same type as the first element particles but having heat without light (unlike those first element particles which compose luminous bodies).[18]

17/ AT VI, pp. 110-111.

18/ Actually Descartes does not explicitly state, to my knowledge, what element the animal spirits are, and different commentators interpret them differently. Kemp-Smith takes them to be first element, citing several passages in support of this. (New Studies in the Philosophy of Descartes, p. 131 and footnote) Others, for example, Nancy Maull (p. 265) take them to (Continued next page)

The sensory functions involving the fibers and the motor functions involving the spirits are thus performed by different elements biologically, but there is some interaction, since when a sensory nerve fiber is being stimulated this has a tendency to make the spirits enlarge the opening of the tube in the brain, so that more spirits flow into it. This framework permits him to explain reflex actions: the stimulation of certain nerves can cause the movement of the animal spirits into certain tubules, as when the sheep sees the wolf and flees, or when I throw up my hands to protect myself when falling, or blink my eyes when a friend makes a gesture as if to hit me, even when I know he won't do it.

Turning more specifically to the structure of the visual system, we find him explaining the point-for-point projection of the retinal image to the cerebral cavities, making use of the attached diagram [See Fig. IV-2, on page 256.][19/]

The motions which the light imparts to the optic nerves are transmitted in the following way. The rays

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18/ be third element. The former interpretation seems to me to fit better since the most subtle of the animal spirits are what gives heat to the animate body, and thus are like first element particles.

19/ The following account and diagram are taken from the end of the 5th Discourse of the Dioptrics, AT VI, p. 128-9.

which come from V touch at R the ends of the optic nerve coming from 7. And so also the rays from X go from S to 8, and those from Y go to T and through the nerve to 9. Thus it is obvious that there will be another picture formed at 789 similar to objects V, X and Y. From there it will be transmitted to the pineal gland and the two images from the two eyes merged (corresponding points from the two retinae being superimposed).

C. The Pineal Gland

With this merging of the two images at the pineal gland, we enter an area which was scientifically quite speculative at the time he was writing. Descartes' hypotheses here fall almost more into the category of science fiction than physiology, and philosophical considerations clearly play an important part in determining the sort of mechanisms he postulates.[20/]

He selected the pineal gland as the organ where the soul exercises its sensory functions because it is the only organ in the brain which is not bilaterally symmetrical, and he believed an actual merging of the images from the two eyes was necessary to explain our perception of a

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20/ Polyak, in his encyclopedic work, The Vertebrate Visual System speaks of Descartes' physiological work as "speculations" based on the "few positive anatomical facts known to him," and his theories about the animal spirits as "fantastic elaboration". He also says that Descartes' speculations now appear "naive and vacuous". [pp. 100-105]

unified object.[21/] Having selected it as the seat of the soul, he had to hypothesize that the optic nerves somehow connect to it (either directly or by means of the animal spirits). He had, however, virtually no physiological evidence for this; he knew that the nerves did not all connect to the pineal gland, which is the reason he developed the complicated theory about the animal spirits having a

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21/ The clearest statement of this line of reasoning occurs in a letter to Meysonnier in 1640 (Kenny pp. 69-70) where he says "Since we see only one thing with two eyes, and hear only one voice with two ears, and altogether have only one thought at a time, it must necessarily be the case that the impressions which enter by the two eyes or by the two ears, and so on unite with each other in some part of the body before being considered by the soul." A similar argument is presented in Passions of the Soul, Part I, Art. XXXII. A passage from the Dioptrics appears, however, inconsistent with this one. He says that "the blind man does not judge that a body is double although he touches it with two hands, thus, when our two eyes are both disposed in the way necessary to enable us to direct our attention toward the same place, they must only make us see one object, although a picture is formed in each of them." It would appear that it is the soul's ability to direct its attention from both eyes to the same object and not merely a physiological merging which causes us to see it as single. A third passage provides a key to reconciling these. He says "He says the soul can utilize double parts, or use the spirits, which do not all reside in this gland. I agree, because I do not think that the soul is so imprisoned in the gland that it cannot act elsewhere. But utilizing a thing is not the same as being immediately joined or united to it; and since the soul is not double, but single and indivisible, it seems to me that the part of the body to which it is most immediately joined should also be single ..." To Mersenne, 30 July 1640, Kenny p. 75.

a connecting role.[22/] This could not be verified, since he supposed that these spirits were too small to see and presumably vanished with the death of the animal.

We will begin our consideration of this important topic with a careful examination of the relevant texts. His remarks in the Dioptrics are quite sketchy on this point, and no diagram is provided which illustrates this second projection of the retinal image to the pineal gland. After discussing the projection of the retinal image to the cerebral cavity he says:

> ... and from there I could again transport it right to a certain small gland ... I could go even still further, to show you how sometimes it [the picture] can pass from there through the arteries of a pregnant woman, right to some specific member of the infant ... and there forms these birthmarks... [Olscamp p. 100, AT VI, p. 129]

Two things need to be noted here. First of all the "picture" which is being transported is the retinal image considered as a pattern of motions, the motions being determined at each point by the ratio of spin to forward motion of the light particles. The relative positions of the points are preserved in transmission to the cerebral cavity as shown in the diagram, and are presumably also

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22/ On this point Polyak is in error, supposing that Descartes' theory was disproved by the discovery that the nerves do not all connect to the pineal gland. [Polyak, p. 104] A letter to Mersenne in 1641 (AT III, p. 362) proves that Descartes was aware of this fact.

preserved in the transmission to the pineal gland. And the second thing is that such a "picture" seems hardly the sort of thing which could be transported thrqugh the blood, and Descartes makes no attempt to describe any plausible vehicle or mechanism for this taking place.

Thus in order to make sense of this, we are forced to look at his more detailed account in Traite de l'Homme. This account goes part way toward reconciling the difficulty, but not in a completely satisfactory manner. The element stressed in l'Homme is the role of the "animal spirits". These are hardly mentioned in the Dioptrics, where we are left to suppose that it is only the motions in the nerve fibers which, when transmitted to the pineal gland, cause our sensations. The explanation in l'Homme suggests that when certain nerve fibers are stimulated this causes the tubules of those nerves to dilate their openings in the cerebral cavities. This in turn causes the animal spirits flowing out of the pineal gland to flow more strongly toward those tubules, and thus creates a sort of pattern traced on the pineal gland by the outflowing spirits. It is this pattern which is connected to our idea, and not the pattern of motions in the nerve endings at the cerebral cavity.

This central role of the animal spirits is confirmed in a letter to Mersenne of April 21, 1641.[23/] Mersenne had objected to the pineal gland as the seat of the soul since no nerves connected to it. Descartes answered:

> ... it is impossible that they [the nerves] all connect to it otherwise than by means of the spirits, as they do at the pineal gland. It is certain also that the seat of the common sense must be very mobile, to receive the impressions which come from the senses; but it must be such that it can only be moved by the spirits which transmit these impressions, and only the pineal gland is of this sort.

This, to some extent, helps to solve the problem of how the picture or image of the thing seen could be transmitted through the blood to the child in the womb, since the animal spirits form part of the blood. However, although it is easy to conceive of an image in the motions of the nerve endings in the cerebral cavity (or in the openess or closedness of the tubules, as he stresses in l'Homme), or in the pattern traced on the pineal gland by the spirits leaving, it is difficult to understand how the spirits which are in constant rapid movement could convey an image through the arteries. But it is clear that Descartes thinks they do, because he reiterates in l'Homme his claim that "the traces of these ideas pass through the arteries towards the heart ... to imprint themselves on the

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23/ AT III, p. 362.

limbs of the infant".[24] This sort of transmission of images by the spirits is also involved in his explanation of memory which immediately follows the passage just quoted.

The most likely explanation for these theories being propounded by Descartes is that they are a carryover from the Aristotelean tradition which, as we saw, attributed to the cardiovascular system many of the sensitive functions later assigned to the nervous system. Descartes does very little to integrate these earlier views with his own, and seems to include them by force of habit without thinking out the mechanisms of the process very thoroughly.

D. Action of the Pineal Gland Image Upon the Soul

The question, of course, which thrusts itself upon the philosopher who has followed the elaborate mechanisms all the way to the pineal gland, is 'how does all this generate something as unlike it as our ideas or sensations?' Descartes' answers on this point in the optical writings are rather crudely materialistic and disappointingly naive. We are told in l'Homme that:

> ... it is not those [figures] which are imprinted in the organs of external sense, or in the interior surface of the brain, but only those which are traced in the spirits on the surface of the gland H, where the seat of the imagination and common sense is located, which must be taken for ideas, that is to say for the forms or images which the reasonable soul considers immediately, when, united to

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24/ AT XI, p. 177.

> this machine, she imagines or senses some object. (AT XI, pp. 176-177)

And a bit further on he says:

> I want to include generally under the name 'idea' all the impressions which the spirit can receive in flowing from the gland H, which are attributed to the commmon sense when they depend on the presence of objects, but they can also proceed from several other causes ... and then it is to the imagination that they should be attributed. (AT VI, p. 177)

And several paragraphs later he says:

> After the spirits flowing from the gland H have there received the impression of some idea, they pass ... (Ibid.)

It is hard to avoid the interpretation that here we have the soul contemplating patterns traced by the spirits on the surface of the pineal gland, which patterns are equated with ideas and said to be "what the soul considers immediately".

In the Dioptrics, also, he is able to do little more than assert that, strange as it may seem, these motions do act upon the soul to produce sensations.

> It is the movements of which the picture is composed which, acting immediately on [french "agissant contre"] our mind inasmuch as it is united to the body, are so established by nature to make it have such perceptions. (Olscamp, p. 101, AT VI, p. 130)

If pushed to explain this "nature", he falls back on God, especially in later writings when his metaphysics has been better elaborated. It is God who has affixed the various

sensations to the motions. This is possible because the mind does exist in quasi-substantial union with the body. If an angel were to be in a human body it would only perceive the motions there, but not have sensations as we do.[25] What happens, then, in the human case is that what the soul is immediately considering is material in nature, but it is not considering it as a physical pattern of motions, but rather as a pattern of light and color (for vision), or as thirst, joy, etc. Although it may sound strange to say that the soul is "immediately considering" a physical pattern of motions, open tubules, patterns traced on the pineal gland, etc. when it is having sensations, this does seem to be what Descartes is saying here.[26]

Summary

Stepping back for a moment and looking at Descartes' contributions to the physiology of vision, what stands out

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25/ Kenny, (ed.) Letters, p. 128.

26/ This reading of Descartes is confirmed by Norman Kemp Smith who says that in perception the mind contemplates or is immediately aware of brain patterns (ideas corporeas) -- specifically the patterns in the pineal gland. [Kemp Smith, New Studies in the Philosophy of Descartes, pp. 146-6.] A similar position is taken by Hamelin [Hamelin, Le Systeme de Descartes, pp. 352-3.] and by Edward Reed in his article "Descartes' Corporeal Ideas Hypothesis and the Origin of Scientific Psychology". In this article he hails Descartes as the father of modern psychophysiology, since he held that "all awarenesses are awarenesses of brain states" (page 733) and that "brain movements are the objects of thought". (Ibid.)

most clearly is that he has attempted to explain our perception of a unified object based wholly upon anatomical structures and mechanically describable changes in the figure and/or motion of the retinae, nerves, animal spirits and brain. He seems to think that he has explained our perception of the object if he has provided for the formation of a unified cerebral copy of it, or at least he believes such a copy is necessary. As we shall see in Part III, he realizes that some supplementary mechanisms are required, but the material presented above still provides the essential core of his theory of vision.

Unfortunately this zeal to provide for a unified cerebral image of the object led him into unfounded and erroneous physiological speculations, as well as on a more subtle level, wrongly leading us to see the eye as functioning like a camera. Although the basic idea of a point for point projection of the retinal images to the brain has stood the test of time, the hypothesis that they are merged to form one image has not. The retinal images are projected into several different areas of the brain, are subject to considerable topological distortion, and although the nerves from corresponding retinal points in the two eyes have been traced to contiguous brain areas, there is

no evidence that they are ever actually merged.[27] Thus the unity of our perceptual experience is not to be accounted for by physiology alone.

Modern science thus destroys the physiological basis for any very straightforward copy theory of perception. Descartes' physiological theory, by contrast, sets us up for it. He does not hold the idealist form of the copy theory according to which we perceive only a mental copy or image. Rather we are perceiving a physical pattern traced in the pineal gland surface primarily, although we are experiencing the sensations affixed to those motions by God. However, as we shall see in Chapter V, the purely idealist form of representationalism grew quite naturally out of Descartes' more physiologically oriented form of it.

27/ Pirenne, Vision and the Eye, pp. 193-196. He says, among other things that "There is no neurological explanation of the fact that we normally do not 'see double' when we look at objects with both eyes." Indeed, as he points out, the disparity between the retinal images serves as an important cue for depth perception.

PART III: HOW WE SEE

In the Sixth Discourse of the Dioptrics, entitled "De la Vision", Descartes undertakes to explain how, on the basis of the the mechanics of vision which we have examined above, we are enabled to perceive light, color, situation, distance, size and shape. All the qualities which we can perceive in objects of sight, he tells us, can be reduced to these.

A. Light and Color

In explaining our perception of light and color, which, Descartes says, are the only things which belong properly to the sense of sight, ("appartiennent proprement au sens de la veue")[28] he says:

> We must think that our soul is of such a nature that the force of the movements which are found in the parts of the brain from which the optic nerves originate make it have the sensation [sentiment] of light; and the manner [facon] of these movements that of color. [AT VI 130-131]

It is in this manner, he says, that the nerves from the ears make us perceive sounds, those from the tongue savors, etc.[29] As evidence for this view he cites the facts that we see light when the eye is struck, and the

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28/ AT VI p. 130

29/ As Alquie notes (Vol. I, p. 701, Descartes thus anticipates Muller's (1801-1858) well known theory of specific nerve energies.

behavior of after images. The fact that after-images change color as they fade confirms, he thinks, his view that the nature of color consists in diversity of movement.[30] This view builds, of course, upon his theory of light as a pressure in the second element particles and color as a function of the ratio of spin to forward motion of these particles.

The quantity of light that we see is determined by the force with which each of the optic nerves is moved, which itself is a function of a number of variables: the quantity of light which is in the objects,[31] their distance, the size of the pupil and the amount of space which the rays from each part of the object occupy on the retina. Our vision of colors is likewise conditioned by these same physical variables. Specifically we are able to perceive only as many differently colored parts to an object as there are optic nerve endings in that portion of the retina upon which its image is projected. The space occupied by the ends of each of these nerves must be considered as a point. If the object had four thousand parts and there were only one thousand optic nerves in that portion of the

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30/ Olscamp p. 101-102.

31/ This is a rather odd way of putting it, as according to Descartes' theory of light there is no light in objects. They merely reflect in various ways the light given off by luminous bodies.

retina, we could only perceive one thousand parts, and each nerve would be moved in a kind of composite manner.[32] Thus distant fields or mountains often appear to be all of one color.

This account of color perception is important for several reasons. First of all it confirms the importance of the fact that the image conveyed to the soul at the pineal gland really does bear a resemblance to the retinal image, and thus to the object. The motions which signify the various colors are arranged spatially in the very same way as occurs on the retina. This is essential to our being able to discriminate the colors and, presumably, their relative spatial arrangement, which is a necessary part of our ability to perceive the figure (or shape) of the object. And secondly, this passage is the source of the view which we shall find in later writers, including Berkeley, that our visual field consists of unrelated visual points like a mosaic.

Having explained our perception of light and color, it would seem that our task has been accomplished. The figure (rather than the form) of the object has been impressed upon the retina and mechanically transmitted to the soul at the pineal gland where it acts upon the soul, and our

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32/ Olscamp, p. 104

perception of the spatial arrangement of colors in the object has been explained. However, there is an important hitch at this point: the retinal image is roughly two-dimensional, reversed and inverted, and objects are represented in it in a way very different from the way we actually see them, being subject to perspective distortions, nearby objects taking up more space than distant ones, etc. It would seem, thus, that our perception of their size and shape would be incorrect. Also, the two-dimensional image does not tell us where the object is located relative to our body (its situation), or how far away it is (distance). Hence some supplementary mechanisms must be postulated to account for our correct perception by sight of these qualities of objects.

B. Situation, Distance, Size and Shape: Introductory Remarks

Descartes' successors saw fit to draw a very sharp distinction between our perception of light and color on the one hand, which they took to be the work of the sense of sight, and our perception of situation, distance, size and shape, which they thought was the result of a judgment by the mind. Certainly these latter are not explainable solely by the physiological mechanisms of the point for point projection of the retinal images to the pineal gland and their merging to form one image. But are we entitled

to conclude from this fact that therefore our perception of them involves a special mental act of judgment?

Descartes' thinking on these questions in the optical writings is apparently still in flux. For example, while the account of shape perception in l'Homme does not include a reference to any sort of judgment or reasoning, being thought to be explainable merely by the fact that a resembling shape is traced on the retina, in La Dioptrique he clearly specifies that figure is judged. Within the Dioptrics, also, we find him generally ambivalent about the role of judgment. Situation perception is not said to involve judgment, although it may involve the mind directing its attention out from points on the retina. At least one of the means for perceiving distance, namely eye shape, seems to involve no judgment or reasoning by the mind, and even the famous natural geometry theory, at least for the case of binoccular vision, could be read in such a way as not to involve judgment. It is size and shape perception, cast as they are in terms of the homunculus model, which most unequivocally postulate an act of judgment.

The most likely source for this sharp separation between light and color as acts of sense, and all other things perceived by sight as acts of the understanding, is Descartes' Response to the 6th Set of Objections, (1641)

where he distinguishes the three grades of sensation.[33] The first is the mere movements of the sense and brain -- something we share with the animals. The second is "the immediate mental result" of this; due to the union of soul and body, the motions make us experience colors, pains, odors, heat and cold, etc. Speaking accurately, he says, only the second level should be assigned to sense. Thus in vision we perceive light and color by sense. The third grade of sensation is not properly sensation, but is made up of those judgments we have made from our youth which have become so habitual that we mistake them for sensations. Thus, referring back to the Dioptrics, he says we perceive distance, shape and size only by a judgment of the understanding. Even the perception "that there is a staff situated without me" is said to be an act of judgment.[34] Indeed he supposes that I must reason "from the extension of that color, its boundaries, and its position

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33/ Nancy Maull, for example, who sees Descartes as trying to give "a mechanistic explanation of the perception of color, distinguishable in kind from the mechanistic explanation of magnitudes ... a psychophysiological explanation of the difference between primary and secondary qualities" (p. 258), relies heavily upon Descartes' Responses to the 6th Set of Objections.

34/ HR II, pp. 251-2.

relatively to the parts of my brain" to figure out its distance, size and shape.[35]

His thinking here has matured philosphically considerably, since he has just completed the Meditations. He has become more aware of the problem of externality perception, attributing even the perception that "there is a staff situated without me" to an act of judgment. He seems, in general, to have moved in the direction of explaining our perception of light and color on the mechanical model, and our perception of all the qualities of objects which essentially involve their spatial position relatively to us, on the homunculus model. Interestingly he seems unable to decide which category to put situation perception in, and hence omits it.

It is of value to keep these distinctions in mind as we go through the accounts of our perception of situation, distance, size and shape given in the Dioptrics, but we must beware of reading the sharp distinction of sense and judgment back into that work, even though Descartes himself

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35/ This way of putting it is strange and does not correspond to anything he says in the Dioptrics. Nowhere there does he speak of my reasoning about the position of anything "relative to the parts of my brain". This supports the general position I am taking about the Responses to the 6th Objections -- namely that what he says there cannot be taken at face value as accurately representing his own position in the Dioptrics even when he says he is only reiterating what he had said there.

refers back to it. As will be shown below, Descartes in the Dioptrics is still toying with the idea of providing a wholly mechanistic explanation of situation and to some extent distance (although size and shape perception are clearly described as involving judgment).

Situation

The most basic element of our visual spatial perception is our perception of the situation of objects -- that is to say the direction they lie in relative to our body (what psychologists call "egocentric spatial perception"). This is a problem on the face of it because the retinal image is inverted (up-down) and reversed (right-left), so that it would seem we should be misled about the locations of objects. It is also a problem because in perception the soul is in direct contact only with the pattern of motions traced by the departing animal spirits at the surface of the pineal gland and it, thus, is something of a mystery how it can perceive an object as out from us in space at all.

It would seem that the first problem could be resolved mechanically simply by re-inverting the image between the cerebral cavities and the pineal gland. In fact this has sometimes been thought to be Descartes' own solution[36/]

36/ See, e.g., Polyak, p. 103.

based upon a diagram given in l'Homme which shows a re-inversion [Fig. IV- 3]. However, the figure is not referred to in the section where he discusses situation perception, and was not Descartes' own drawing, having been added by someone else after his death.[37] And a little reflection shows why this would not have solved the problem of situation perception. If the situation of an object is the direction it lies in relative to my body,[38] then my perception of the spatiality of my own body must be an essential element in that perception; the presence of either a right-side-up or an upside-down image in the pineal gland will not solve the problem for, considered alone, it tells us nothing about the spatial location of what is represented in the image relative to our body. He thus falls back on, and relies very heavily upon, our perception of the spatiality of our own body -- which enables him also to provide a sort of solution to the second problem of how we perceive objects as out from us in space.

> We do not perceive it [situation] otherwise by means of our eyes, than we do by means of our hands; and our knowledge of it does not depend on any image, or on any action which comes from the object, but only on the

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37/ Adam and Tannery, Vol. XI, Avertissement, pp. vi-vii.

38/ Descartes' definition of "situation" is "the direction in which each part of the object lies, with respect to our body." Alquie (ed.), Oeuvres Philosophiques, Vol. I, p. 704.

> position of the little parts of the brain, from which the nerves take their origin; for this position, changing however slightly each time the position of the parts of the body where these nerves are inserted changes, is instituted by nature so that the soul can know not only where each part of the body it animates is relative to the other parts, but also so that the soul can transfer its attention from each part to all the places on the straight lines which one can imagine stretched from the extremity of each of these parts to infinity. [Olscamp p. 104-5, AT VI, pp. 134-5]

Our knowledge of the spatial position of our own body is thus the necessary basis for our perception of the spatial location of physical objects. He then goes on to develop an explanation of situation perception which treats vision as, essentially, a form of touch. Our eyes do not touch objects, obviously, so he is forced to use the analogy between vision and a blind person with a stick -- the light rays playing the role of the sticks. To explain situation perception he develops this analogy on two different levels. The simpler solution to the situation perception problem involves our awareness of the direction in which our eye or head is turned. This is analogous to the blind man's awareness of the direction in which his hands are turned. This is the only solution given in Traite de l'Homme, where he merely says that we know the situation of objects because of the changes in the muscles or nerves which accompany the turning of the eyes to look at

different objects.[39] In other words, we are aware by proprioception (to use a more modern term) of the direction in which the object we are looking at lies.

But not all situation perception would seem to depend upon these mechanisms, for we are able to perceive the relative situations of several objects at once (i.e., seen with one eye fixation) and eye or head movements would be of no use here. In order to explain this Descartes adapts the blind man with crossed sticks analogy to the case by taking two different points on the retina to be analogous with the blind man's two hands. He develops this as follows:

> If he turns his hands A and C toward E, [see Fig. IV-4] the nerves inserted in the hand cause a certain change in his brain which gives his soul the means of knowing not only the places A and C, but also all the others which are on the straight lines AE or CE, so that the soul can direct its attention as far as objects B and D, and determine the places where they are, without for this purpose having to know or think in any way about the places where his two hands are.
>
> Now, if our eye or our head turns in some direction, our soul is informed of this by the changes which the nerves, inserted in the muscles used in these movements, cause in our brain. As here, in the eye RST we must think that the position of the optic nerve which is at point R, S or T, [See Fig. IV-2] is followed by another certain position of the part of the brain 7, 8 or 9 which enables the soul to know the places which are on the line RV, or SX or TY: so that you must not find

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39/ AT XI, p. 169.

> it strange that objects can be seen in their true situation although the picture which they print in the eye has a wholly contrary situation. Thus, our blind man can sense the object B which is to the right by means of his left hand, and D which is to the left by means of his right hand. [AT Vol. VI, p. 135, Discourse VI Dioptrics (my translation).] [Olscamp p. 104-5]

Although mention is made of our turning our eyes or head (the first mechanism mentioned), he seems to be suggesting also that our seeing object Y which is to the left by means of our optic nerve T which is to the right is to be understood as like the blind man's feeling object B which is to the left by means of his hand C which is to the right. And since the blind man directs his attention out from his hands in straight lines (along the lines made by his sticks), it would seem in this case also that some sort of directing of attention out from points on our retina along straight lines (this time light rays) is implied.

This passage is the source from which later optical writers took their solution to the problem of situation perception. But whereas in this passage no explicit mention is made of the mind tracing back along light rays (as Berkeley described it),[40] this is how the solution

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40/ New Theory of Vision, §89-90. He speaks of the mind "tracing the ray that strikes on the lower part of the eye and being directed to the upper part of the objects", "pursuing the impulses they give in right lines", "hunting for the object along the axes of the radious pencils", etc. pp. 207-8, Luce Edition.

came to be understood by later writers. And certainly he seems to imply that some sort of directing of attention is involved, and along straight lines would be the path light rays would follow.

The passage is, however, difficult to interpret. For on the one hand he says that the blind man knows the places A and C where his hands are, and directs his attention out from them toward the object, and on the other hand he says that he does not have to know or think in any way about the places where his two hands are. Which of these we settle on makes a difference, for if he knows the relative positions of points on his retina and directs his attention out from those places on straight lines, then the "tracing back along the rays" interpretation would be in the spirit of Descartes' explanation. On the other hand, if he really does not know or think in any way about where his hands or points on his retina are, then it is not. Certain motions conveyed to our brains simply cause our perceptions of the situation of objects. The first interpretation is cast in terms of the homunculus model (as described above) while the second is cast in terms of the mechanical model. (The details of how this could be worked out on the mechanical model constitute the problem which psychologists call "directional sensitivity of the retina".)

Had Descartes stuck to the mechanical model, his only explanation of why we perceive objects as out from us in space rather than in our eyes or hands, or in our brains (since that is where the motions are) would have had to be that God simply chose to annex our sensations of the situation of objects external to us in space to certain motions in our brain because this would be conducive to the preservation and well-being of the soul-body composite. Apparently he found this sort of explanation insufficient, perhaps because of its failure to include any reference to my perception of the spatiality of my own body, and hence introduced the soul's ability to transfer its attention our from various body parts in order to ascertain the situation of objects relative to my body.

Since Descartes believes that the soul is united to the body, he may well be entitled to speak of the soul's transferring its attention out from the hands or eyes, although one might wish that he had provided a more thorough explanation of this. All the same, there are some problems with this account of how we can perceive the situation of multiple objects with one eye.

One difficulty with his explanation here, however, is that the analogy between sight and a rather specialized case of tactual perception (the blind man with a stick) is a rather weak analogy. For while a blind man can think

about where his hands are and direct his attention out from them in straight lines, we cannot think about the relative positions of points on our retinae or direct our attention out from them in straight lines, since we are never conscious of the spatial position of our retinae or points on them. Furthermore, directing our attention is a mental act, and since Descartes equates mind with consciousness, a mental act of which we cannot be aware (such as directing our attention out from different points on our retinae) is something of an anomoly.

It should also be noted that to the extent that his account of situation perception relies on the soul's ability to be present in the hands or eyes, and to direct its attention out from them in straight lines, it stands as an exception to his position (enunciated in the fourth discourse of the Dioptrics) that the soul senses inasmuch as it it present in the brain where it exercises the faculty of the common sense[41/] and that while remaining in the brain in can, by means of the nerves, receive impressions from external objects.[42/] Perhaps the apparent inconsistency could be reconciled along the lines of Descartes'

41/ AT VI, p. 109.

42/ Ibid.

explanation in a letter to Mersenne[43/] that the soul can "utilize" other body parts, but is "immediately joined" only to the pineal gland.

Distance

Descartes' account of visual distance perception builds upon his explanation of situation perception; it involves the question of how far away the object is rather than simply the direction it lies in. Since the retinal image is two-dimensional, some supplementary mechanisms are obviously needed. Descartes provides us with five means by which distance is perceived or seen, two of which involve the controversial "natural geometry" theory. His discussion of distance perception was very influential upon Malebranche and Berkeley. By contrast with the latter, Descartes' explanation of distance perception is noteworthy in that: (1) He does not deal explicitly with the problem of our perception of externality (why do we perceive objects as external at all?) which so troubled Malebranche and Berkeley as we shall see; (2) He does not draw a sharp distinction between seeing and judging, but instead is rather careless and inconsistent in his use of terminology, speaking of distance alternately as "perceived" (apercevoir), "seen" (voir), "judged" (juger) or simply as "known" (both connaitre and savoir are used), and (3) Some

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43/ Kenny, Letters, p. 75, AT III, 119.

of the things he lists as means of perceiving distance are things we are not (and probably could not) be conscious of, whereas Malebranche and Berkeley admit only means of which we can be aware.

1. Eye Shape

The first non-geometrical explanation for our ability to perceive distance visually involves the shape of the eye. This shape must be different in order to enable us to see nearby objects clearly than it is when we perceive distant objects. This we know from the experiment described earlier with the dissected eye: the shape of the eye must change (or be changed by pressure) in order for objects at different distances to be brought into focus on the retina. Thus he supposes that in normal vision, we change the shape of our eye in order to enable us to proportion it to the distance of the objects, and this moves parts of our brain in a way instituted by nature to make our soul perceive this distance.

> And this happens to us ordinarily without our having to reflect about it; in the same way as when we grasp some object with our hand we make it conform to the size and shape of the object, and feel it by this means, without for this having to think about these movements. (AT VI, p. 137)

This explanation is clearly cast in terms of the mechanical model. Eye shape varies regularly with distance and thus it can cause changes in our brain which vary

regularly with distance. These changes in the position or motion of parts of our brain cause our perceptions of differing distances because of the way God connected our soul and our body. There is no need for the perceiver to be aware of the shape of his eye as such, although Descartes does not actually deny that we are or can be aware of it.

The next two means for perceiving distance which Descartes describes both involve the controversial "natural geometry" theory upon which Berkeley centered his attack in the New Theory of Vision. The theory is expounded in the Dioptrics first in terms of binoccular vision, and then for monoccular vision, although the account in l'Homme includes only the former.

2. Natural Geometry: Introductory Remarks

Before beginning our examination of the texts, it is appropriate to go briefly into the purpose and importance of this theory. The position taken here will be that Descartes is trying to do only what he says he is in these passages -- namely to explain how, notwithstanding the two-dimensionality of the retinal and brain images, we are able to perceive how far away things are. This goal is, of course, part of the broader goal of the Dioptrics, which was to show how visual perception can be fully explained on Descartes' own mechanistic principles, and without reference to those entities postulated by the scholastics.

His outlook here, as in the Rules, is essentially a realistic one.

Berkeley, coming on the scene at a time when the view that we immediately or directly perceive only ideas was prevalent, saw the natural geometry theory as trying to prove that we have a necessary and a priori means for telling how far away objects are, and believed that if this were true, the existence of objects out from us in space would be established (and his immaterialism thus disproved).[44/] There is no evidence, however, that Descartes viewed the natural geometry theory as having any such important epistemological role, or even that he perceived at the time of writing the Dioptrics how serious the problem of externality perception was. Hints of such an awareness appeared in the Reply to the 6th Objections as

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44/ See NTV §5 where he says "... there appears a very necessary connection between an obtuse angle and near distance, and an acute angle and farther distance. It does not in the least depend upon experience, but may be evidently known by anyone before he had experienced it." See also, Principles, §43: "For that we should in truth see external space and bodies actually existing in it, some nearer, others farther off, seems to carry with it some opposition to what hath been said of their existing nowhere without the mind. The consideration of this difficulty it was that gave birth to my Essay Towards a New Theory of Vision, ... wherein it is shown that distance or outness is neither immediately of itself perceived by sight, nor yet apprehended or judged of by lines or angles, or anything that hath a necessary connection with it; but that it is only suggested to our thoughts..."

discussed above, where he attributed our perception of the external existence of the stick to an act of judgment. But in the Dioptrics and L'Homme he does not even raise this issue. Our means for knowing distance are, as he stresses in both works,[45] highly approximate and fallible. But that there are objects external to us, and that we perceive them as such, he expresses no doubt.

Nancy Maull's very interesting arguments to the effect that the purpose of the natural geometry theory was to establish the applicability of Euclidian geometry to nature (Kant's problem), is open to the same objections. Whether or not the natural geometry theory can be seen by hindsight to fill this gap in Descartes' philosophical system, Maull clearly goes beyond the evidence in supposing that this was Descartes' intention in developing it.[46] To establish this latter claim, she would have to show from the texts that Descartes was aware that there was the gap she points to -- i.e. that it is necessary to somehow prove that geometry is applicable to nature -- and that he saw the natural

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45/ See l'Homme, AT XI, pp. 162-3, and La Dioptrique, AT VI, pp. 144-147.

46/ Maull, p. 254 "Descartes imported the geometrical reasoning into his psychophysiological theory of perception quite intentionally and in order to answer a question: 'How is a priori geometry (specifically three-dimensional Euclidean geometry) applicable to nature? Or, how is mathematical science of nature possible.'"

geometry theory as doing this. This she does not do. Indeed the brevity of Descartes' presentation of the natural geometry theory (23 lines total for both binoccular and monoccular distance perception) would seem to weigh against his having had such grandiose purposes for it as either Berkeley or Maull suggest.

Binoccular Distance Perception

The first of the geometrical means for telling how far away objects are is the way in which we can make use of our having two eyes separated from each other and each turned toward the object. Since it involves knowledge of the direction our eyes are turned in, it builds upon the way in which his discussion of situation perception explained our ability to know this. We "know" distance, he says (and here the french verb is "connaitre", which has the meaning of "to be acquainted with" -- the same verb as he used in the situation section):

> by the relation which the two eyes have to each other. For as our blind man, holding two sticks AE, CE, whose length I suppose him not to know, and knowing (savoir) only the distance between his two hands A and C, and the size of the angles ACE and CAE, can from that, as though by a natural geometry, know (connaitre) where E is; thus when our two eyes RST and rst are turned toward X, the length of the line SS and size of the two angles XSs and XsS make us know (connaitre) where the point X is. (AT VI, p. 137) [See Figs. IV-4 and IV-5]

There are several interesting things about this passage. The first is his use of the verbs "savoir" and "connaître". The verb "savoir" (connoting more of an intellectual kind of knowledge) is used to describe the blind man's knowledge of the distance between his hands and the angles made by the sticks, while "connaitre" (meaning "to be acquainted with") is used to describe his knowledge of where the point E is. The parallel passage in l'Homme uses the two verbs in exactly the same way.[47/] He seems to be trying, through this use of the different verbs to arrive at the sort of directness and immediacy associated with the verb "connaitre," starting from a rather more intellectual, and perhaps implicitly mathematical knowledge.

Another interesting thing about this passage is that his reference to natural geometry occurs in his discussion of the blind man, whereas in the case of vision he says that the length of the line and the size of the angles "make us know" (connaitre) where the point E is. He also did the same thing in the situation section where he talked about the soul transferring its attention out from the hands along straight lines, but then says in the case of vision that the changes in the brain caused by our turning our eyes "make us know" the places along the straight lines.

47/ (Alquie, Vol. I, p. 428-8).

Although this difference may be insignificant, since he wants us to think of the case of vision as like that of the blind man, still I think Descartes is responding to a significant difference between the cases. The blind man can deliberately think about where his hands are, how far apart they are, the direction his hands are turned, and the angles the sticks make, but it is not clear that we can do this for vision. This leads him to find the homunculus model more comfortable for describing the blind man case -- the transferring of attention, the use of natural geometry, etc. But in the case of vision he is still toying with the idea of providing a purely mechanistic account similar to the one he provided for eye shape. Certain changes in our muscles and brain simply cause us to know the distance or situation of objects because God chose to conjoin these movements with our perception of them.

One last thing to be noted is that in this passage he says that we know where the point E is "as though by a natural geometry," and does not claim that we actually use geometry -- a claim which would indeed cause all sorts of problems even in the more plausible blind man case. It may be plausible to assert that he knows the direction his hands are turned, but surely one would hesitate, for example, to say that he knows his hands are 18 inches apart and that the base angles formed by the sticks are both

55 degrees. This would obviously be a hopeless over-intellectualization of perception.

Monoccular Distance Perception

The previously described means for perceiving distance would be useless for monoccular distance perception; a blind man with only one stick, the length of which he does not know, could not determine with one poke of the stick how far away an object is. Thus, Descartes reasons, he must look at the object from point S and then move and look at it with the same eye from point s. [Fig. IV-5]

> This will suffice to make the size of the line Ss and of the two angles XSs and XsS found together in our imagination, and to make us notice the distance of point X; and this by an act of thought which, being only a completely simple imagination, nonetheless includes within itself a reasoning similar to that which surveyors use when they measure inaccessible places by means of two different observation points. (AT VI, p. 138).

Here, at last, we have an explicit reference to an "act of reasoning". However, its status is quite unclear. It is an act of thought which essentially involves the imagination, since it is the imagination which retains the information necessary for determining the distance of the object -- i.e. the length of the line and the size of the angles. It is a simple act of thought, presumably because we discover no parts in it; it occurs in such a way that we are not aware of making any inferences or doing any reasoning. Yet it includes an act of reasoning. Why, one

might ask, does Descartes find it necessary to postulate an "act of reasoning" here? For, surely, an act of reasoning of which we are unaware is something of an anomoly within the Cartesian framework which equates the mind with consciousness.

Several possible reasons suggest themselves. The most distinctive thing about this case is that it is the only one discussed so far which necessarily involves memory, at least the sort of short term memory involved in the imagination retaining information between the first and second eye fixations. This, however, seems to be merely the sort of "corporeal memory" which we share with the animals, and not anything which would make it necessary to postulate an "act of reasoning".

Another possible reason is because we find with both binoccular and monoccular distance perception a certain sort of irreducible complexity which was not found with our perception of situation. Given Descartes' explanation of vision by means of a point for point projection of the retinal image to the pineal gland, one fixation of one eye just cannot be enough -- either two eyes or two eye fixations are required. Thus it would seem that the mind must somehow be involved in the comparing and combining of the different inputs. This may well be what moves him to speak of reasoning here, although if it is, it is not clear that

the necessity of combining several inputs requires us to postulate any reasoning process or involvement of the mind. After all, several inputs are involved in even the simplest of perceptions, such as my seeing a blue object to my right, which involves at a minimum the different motions which cause us to perceive blue, plus the changes in the brain which enable us to tell which direction our eyes and head are turned. There seems, thus, in principle, no reason why a mechanistic explanation could not accomodate any number of inputs, simply hypothesizing that when all these changes occur in the brain simultaneously they cause us to have certain perceptions, without reference to the mind needing to go through any reasoning process.

The only other possible reason for postulating an act of reasoning here is that in these two cases the inputs which are to be combined are at least implicitly mathematical -- the length of lines and the size of angles -- so that it would seem that the powers of reason would be required to do this. An animal would, presumably, be quite incapable of perceiving distance in this way. Had Descartes provided any account of animals' visual spatial perception, it would have been very helpful for our understanding of human distance perception, but the part of the Principles which was to deal with plants and animals was never completed.

3. Confusion/Distinctness and Force of Light

The second non-geometrical means is an interesting one for our purposes, since it is the one upon which Berkeley centers his theory. In order to illustrate this Descartes has recourse to the diagram he had used earlier to illustrate retinal image formation, complete with the dark room and the man inside looking at the back of the dissected eye. We can, he says, use the confusion or distinctness of the shape (of the object seen) and force or weakness of the light coming from them to see how far away they are. [See Fig. IV-1]

> As when we fix our eyes on X, the rays which come from objects 10 and 12 are not reunited as exactly at R and T on our retina as they would be if the objects were at points V and Y; from which we see that they are farther away from us or closer to us than X is. Then from the fact that the light which comes from object 10 towards our eye is stronger than if the object were toward V, we judge it to be closer, and from the fact that the light which comes from object 12 is feebler than if it came from toward Y, we judge it farther away. [AT VI, p. 138]

Descartes' definition of confusion and distinctness here is clearly given in optical terms. The image of an object projected upon our retina is distinct when the light rays from each point on the object are accurately reunited by the lens at a corresponding point on the retina, and confused when this is not the case. There is, however, an unexplained gap between a statement about how accurately

the rays from each point of an object are re-united at a corresponding retinal point, and such a statement as "from which we see that they are farther away from us or closer to us than X is."

If we were to simply consider this passage with its accompanying diagram in isolation, the most natural reading would be to suppose that the soul, like the man in the dark room gazes upon the retinal image and determines certain things about the objects from it. (This would be the most extreme form of the homunculus theory.) We know, however, that this cannot be what Descartes means here, both because the soul exercises its sensory functions at the pineal gland (not the retina) and because he clearly realized that the soul has no eyes.[48/]

How, then, can Descartes say that from the confusion of the image of an object on our retina we can see that it is farther away from, or closer to us than the point on which our eye is focussed?

He does seem to be thinking in terms of the homunculus theory. Although something like the force or weakness of the light could, perhaps, be connected in a purely mechanical way with our perception of distance, much as eye shape was, confusion and distinctness seem to be in a

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48/ See footnote no. 13 above.

different category. They are defined relationally, in terms of the causal origin of light rays at particular points on the object, and it would seem thus that they would be impossible to specify in purely mechanical terms. No pattern of figure and motion is intrinsically distinct, but is so only in relation to the object whose "image" it is.

If, however, the soul is reasoning from confusion or distictness to distance, what confusion or distinctnes in particular is it reasoning from? The retinal image itself is ruled out by the considerations cited above. The pattern of motions in the pineal gland seems an unlikely candidate, since it is hard to see how such a pattern of motions could be confused or distinct in the way an optical image can. Perhaps Descartes is supposing that our immediate visual experience is identical with the retinal image, so that every feature of the latter is found in the former. This is the most plausible interpretation, although it is subject to the objection that we do not, after all, see the sizes or shapes of objects just as they are in the retinal image, so that therefore our immediate visual experience does not correspond exactly to the retinal image.

Suffice it to say at this point that these are serious problems, involving some very deep issues in his theory of vision, and that Descartes has apparently not thought them out very thoroughly at this time.

4. Previous Knowledge or Opinion

The last means Descartes gives us by which we are enabled to perceive the distance of an object is that if we:

> ... already imagine the size of an object, or its situation, or the distinctness of its shape and of its colors, or merely the force of the light that comes from it, this can enable us, not properly to see, but to imagine its distance. [AT VI, pp. 138-39]

If we are accustomed to look at some object close up, this enables us to judge its distance better than if its size was not so well known to us. If we look, he says, at a sunlit mountain beyond a shaded forest, we know the forest is closer only by its situation. And if we see two boats on the sea which look of equal size (the smaller one being proportionately closer) we are able to judge which of them is closer by the differences in their shapes, colors, and the force of the light.

This group of "means" by which we are enabled to perceive the distance of objects functions as a sort of catch-all category. It includes cases which involve prior knowledge, such as the case where our knowledge of the normal size of boats with certain shapes enables us to tell which is closer. Here he explicitly denies that we see its distance, presumably because an aborigine who had never seen boats could not make use of this particular means of perceiving distance. He does not appear, however, to intend to limit this means only to cases where an opinion

acquired by prior learning is involved. Presumably we see the situation of the forest relative to the mountain at the same time as we perceive the force of the light coming to us from them. If we read him this way, then the door has been opened to a virtually unlimited interaction between our perception of distance and our perception of all the other qualities of objects, and thus to a potentially greatly expanded role for complicated reasoning and judgments by the mind.

Size and Shape

Descartes' account of size and shape perception is of considerable philosophical interest both because of the difference in the treatment of shape between l'Homme and La Dioptrique and because the account of both given in La Dioptrique provides us with perhaps the clearest example of Descartes' use of the homunculus model for explaining perception.

In l'Homme, Descartes says that the soul can know the shape of an object

> Inasmuch as the rays from point 1 come together at point 2 against the optic nerve, and those from point 3 at point 4, and so on, there tracing one [figure] which corresponds exactly to [se rapporter à] its own [the object]. [AT XI, p. 159]

This seems fairly straightforward. We perceive the shape of an object because it is traced upon our retina and transmitted to the pineal gland. However, by the time he

wrote the Dioptrics he sees the process as far more complicated. He writes:

> Figure is judged by the knowledge or opinion we have of the situation of the different parts of the object, and not by the resemblance of the pictures in the eye: for these pictures usually contain only ovals and diamonds when they make us see circles and squares. [AT VI, p. 140-41]

Thus, although figure perception appears to be explainable by the same mechanisms which account for light and color perception -- namely the point for point projection of the retinal image to the brain and pineal gland -- he came to realize that perspective distortions must be corrected for. For the same reason Berkeley in the NTV shows considerable ambivalence about whether figure is immediately seen or not.

The parallel passages on size in the two texts are, in l'Homme:

> The size and all other similar qualities, [are known] only by the knowledge which it [the soul] has of the distance and situation of all their points; as also reciprocally, it judges sometimes of their distance by the opinion it has of their size. [AT VI, p. 160]

And in La Dioptrique he says:

> ... their size is estimated by the knowledge or opinion we have of their distance, compared with the size of the images which they imprint on the bottom of the eye; and not absolutely by the size of these images, as is obvious enough from the fact that when they [the images] are a hundred times larger when the objects are very close to us, they do not, for all that, make us see them as

> 100 times larger, but as nearly the same size, at least if we are not deceived about their distance. [AT VI, p. 104]

While in l'Homme Descartes was beginning to see that some sort of judgment is involved in size perception, the account in La Dioptrique goes farther in trying to specify some of the inputs which go into the formation of that judgment -- specifically our opinion of their distance and the size of the images they imprint on our retina. Speaking in this way, however, exposes him to the same very serious problems we noted in our discussion of confusion and distinctness, without coming any closer to resolving them here than he did there.

From an epistemological point of view, this introduction of what is apparently some sort of little inner object of perception, thought of as being like the retinal image, does raise serious problems with whether we can ever perceive or know external objects directly, or whether perception gives us access only to a little inner copy of them.

Summary

Our perception of light and color, thus, has been explained primarily by virtue of the projection of a pattern of motions to the soul at the pineal gland. That pattern is spatially arranged in the same way as the motions caused in the retina by the light entering the eye, and it causes us to see light and colors because this is the way God joined our soul to our body.

Our perception of the direction in which the objects we see are located relative to our body ("situation" perception) is an extension of the soul's ability to know where all the parts of the body are relative to each other -- a kind of felt image of the body. Just how a wholly incorporeal soul can have this sort of knowledge is not explained, and is presumably one of the sort of abilities it has as a result of God's joining it to the body. The reference to the mind "directing its attention" out from the body parts along straight lines is clearly one of the places where Descartes is struggling to break out of the brain-imprisoned mind model. Similarly his speaking of the soul knowing or feeling where the parts of the body are relative to each other can be seen as an attempt to overcome the starkness of the dichotomy between soul and body.

Our ability to see how far away objects are, and their true size and shape is especially hard for Descartes to explain, given that he has chosen the point for point projection of the retinal image to the pineal gland as the central core of his theory of vision. Although there are some mechanically specifiable inputs which can be supposed to help with distance perception -- motions in the brain caused by changes in eye shape, the force of the light hitting the eye, the movement of the muscles used in turning the eyes, etc. -- these do not seem sufficient. He

thus begins to talk in terms of a little inner judge who reasons about what the real distance of the object is, based on various inputs such as the confusion and distinctness of the retinal image, the angles made by the optic axes, the relative situations the objects, and his prior knowledge of them. Size and shape perception seem the least explainable by the physiology or mechanics of vision alone, and it is in his accounts of these that we find him most clearly falling into the model of supposing a little inner judge who corrects for the distortions of the retinal image.

His account of how we see the various qualities of objects, thus, can be seen as an uneasy mixture of purely anatomical and physiological factors causing our sensations due to Divine intervention on the one hand, and a variety of rather ill-defined mental processes on the other. Our perception of a unified object, and our perception of light and color are more at the physiological/anatomical end of the spectrum, while size and shape are at the other end, emphasizing reasoning and judgment rather than physiology. But the sort of sharp dichotomy between seeing and judging which we find in, say, Berkeley, is not yet present in any very clear form.

PART IV

OUTSTANDING PROBLEMS IN DESCARTES' THEORY OF VISION

Descartes' theory of visual perception which we have been examining at length in the preceding several chapters inaugurates a new era in the philosophy of perception. For the first time a fairly consistent, all-inclusive and apparently scientifically founded alternative to the traditional Aristotelean account has been put forth -- an alternative which recommended itself to his contemporaries as in harmony with the development of the new mechanistic science. Given the bold and sweeping character of his attempted reforms, it is not surprising that there were some rough edges and unresolved difficulties in his theory. Some of these problems, however, proved to be extremely intransigent, in part due to the fact that his explanation of perception involved a rather unstable compromise between a pure mechanistic materialism on the one hand and a sort of spiritism -- a view of the soul or self which Maritain has, perceptively, described as "angelism".[49/] This accounts for the ambivalence we have noted throughout the optical writings between what I have called the mechanical model, and what I have called the homunculus model.

49/ Maritain, Three Reformers, p. 61.

Historically the sort of uneasy compromise we find in Descartes does not long survive his death. It degenerated on the one hand into mechanistic materialism, typified by a view like that of La Mettrie in L'Homme Machine, and in later times by much of modern physiological psychology. On the other hand it evolved via occasionalism into idealism. It is the latter development of his thought which we will trace in the remaining chapter of this essay.

It will be the purpose of this section to highlight the main outstanding problems with Descartes' theory of perception, and his theory of vision in particular; problems which, as we shall see, were bound up with the metaphysical and epistemological issues which led to the rise of perceptual idealism. We will then conclude with a brief discussion of why Descartes did not perceive as problems some of the difficulties with his theory of vision which so troubled his successors.

On the one hand we have the challenge posed to the physiologists of trying to ascertain the truth or falsity of his physiological hypotheses. We have the question of whether his proposed means for distance perception are correct and whether they are sufficient to explain our perceptual abilities. Do we need to add more means, or eliminate some? Such problems as the perceived constancy of size and shape despite retinal distortions were seen as requiring a

great deal more work, and indeed still exercise, and to some extent baffle modern psychologists.

On another level we encounter the rather more philosophical question of how the mind relates to the image traced in the surface of the pineal gland and/or the retinal image. These clearly have a special status for vision, as we saw especially in the sections on confusion and distinctness and on size and shape. But no very adequate explanation of just what that special status involves has been provided. His successors' struggles with this problem were very bound up with the rise of perceptual idealism, as we shall see.

Related to this problem also was the whole problem posed by the natural geometry theory of the role of the mind and/or of judgment in visual perception. Can there be such a thing as an unconscious reasoning process? Do we <u>really</u> use geometry to tell how far away things are? These problems were very troubling to Malebranche, who developed his theory of "natural judgments" to deal with them. Berkeley, of course, answered both questions in the negative. Descartes' sketchy but suggestive presentation of the natural geometry theory, thus, was the source of some very interesting controversies.

His theory of color also left his successors disputing over whether colors were to be identified with some

configuration of the particles on the object's surface, with the spinning motion of the light particles, with our sensation of color only, or perhaps with some sort of "power" in the object to impart that spinning motion to the light particles or to cause that sensation (Locke's view).

On the most general level, of course, we have the central metaphysical problem of how to explain how a pattern of motions in the brain can cause something as unlike them as our sensations. To the end of his life Descartes insisted on the fact that there is a two-way causal interaction between the mind and the body.[50/] Both his

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50/ The causal action of objects upon the soul has been dealt with extensively here. That he continued to hold this view is shown by his letters to Elizabeth, for example the one of 21 May, 1643 in which he speaks of "the soul's power to move the body, and the body's power to act on the soul and cause sensations and passions." [Kenny p. 138] We also find numerous references to the causal interaction of soul and body in the Passions of the Soul. Choosing only a few representative examples, we find that in Part I, Article 13 he says "these diverse movements of the brain cause diverse perceptions to become evident to our soul" [HR I p. 338], and in Part I, Article 14, he says "the action of the soul consists entirely in this, that simply by willing, it makes the small gland to which it is closely united, move in the way requisite for producing the effect aimed at in the volition." [HR I, p. 350] References to the causal action of soul upon body are rarer in the early works we have been considering, although it is clear from what he does say in L'Homme that he thinks the soul can act upon the body. His plan for the work was to treat the body apart, then the rational soul, and lastly to "show how these two natures must be joined and united." [AT XI, pp. 119-120] His speaking of the motions of the pineal (Continued next page)

contemporary critics and his successors expressed bafflement about how two so totally different substances could interact causally, their underlying assumption of course being that two things can interact causally only if they are alike in some way. It is for this reason that Malebranche concluded that our ideas (which are mental in nature) cannot possibly be caused by physical motions in our brains.

Had Descartes not committed himself to the principle that a cause (or to be more precise, a total efficient cause) must resemble its effect, we could hold that his critics were wrong in maintaining that this was a problem for him, and that it arose merely on account of their own erroneous assumptions about causality. But there are a number of Descartes' texts which show that the problem of resemblance between cause and effect was not only one for Descartes' contemporaries, but for Descartes himself. He needs to rely on a varient of the causal likeness principle in his Third Meditation argument for the existence of God,

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50/ (cont.) gland which occur without the contribution of the rational soul [AT XI, p. 184], could be taken to imply that the rational soul does contribute to some motions of that gland. However, the second and third projected parts of L'Homme were never written.

and thus defends it very strongly as a "first principle than which none clearer can be entertained." 51/

He states the causal likeness principle in several different ways:

> The cause we are speaking of is the total cause, the very cause cannot cannot produce anything which does not resemble it. [AT V, p. 156]
>
> There can be nothing in an effect which is not pre-existent in the cause. Kenny, op. cit., p. 114
>
> There is nothing in an effect which is not contained formally or eminently in its efficient and total cause. Kenny, op. cit., p. 91.

It may be possible to develop an interpretation of these statements which does not rule out mind/body interaction, and a thorough discussion of this would take us beyond the scope of this essay. All the same, it is fair to say on the basis of the passages quoted above that there is at least a prima facie difficulty with explaining mind-body causal interaction, and that therefore the issue is one which his successors had to struggle with.

The other most general problem is the epistemological one of whether perception, and vision in particular, give us knowledge of the external world, and the nature and reliability of such knowledge. As philosophers, most of us

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51/ HR, Vol. II, p. 34.

have been exposed to these questions primarily in the context of the Meditations, with its emphasis on arguments from illusions, dreams and the possibility of a demon deceiver. The more scientifically oriented works on vision which we have been considering here give us a different and in some ways complementary perspective on the problem of our knowledge of the external world.

The difficulty mentioned above of how the soul relates to the retinal and/or pineal gland images really lies at the heart of the problem. Are they in some special sense "given" to the soul in perception, or are they merely part of the causal chain like our nerves are? We see by means of our nerves, but we do not perceive them. However Descartes, as we have seen, does speak as though the retinal image or its brain correlate are open to inspection by the soul. For example, he says that the confusion or distinctness of the retinal image is one of the means by which we see how far away objects are [52] and that our ability to estimate the correct size and shape of objects involves our considering "the knowledge or opinion we have of their distance compared with the size of the images which they imprint on the bottom of the eye."[53] But if

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52/ AT p. 138

53/ AT VI, p. 140.

the soul is thus really given an inner image (either the retinal image or its brain correlate) and must somehow get from that image to the object located out from us in space, then the epistemological problem arises of how we can know that those external objects exist or what they are like.

In a spirit of charity, we might consider such statements as merely careless remarks or lapses on Descartes' part, since we know that he is not so naive as to suppose that we have eyes in our brains with which to look at the retinal images.[54/] However, it is not possible to dismiss them so lightly, because the logic of his theory of vision requires him to suppose that the retinal image or its pineal gland correlate is somehow open to inspection by the soul. He has attempted to provide a mechanistic, anatomically based explanation of vision by hypothesizing the point for point projection of the retinal images to the pineal gland where they are merged to form a unified cerebral image. However, the correct perception of the distance, size and shape of objects cannot be wholly explained in this way, and hence, he believes, the soul must make judgments about their size and shape by "comparing" their retinal size and shape with other inputs available to it. And logically, if it is to correct for the defects of an

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54/ AT VI, p. 130.

image it must have some sort of access to that image in order to compare it with anything or to correct it.

Certainly the retinal image, and its pineal gland correlate, have no special epistemological priority for Descartes; were we to go by that alone we would be almost always mistaken about objects. Nor does he say that our perception of it is "immediate" or "direct" while external objects are perceived only indirectly. But once he has admitted the existence of an inner object of perception at all, and especially when he has allowed us to think of it as analogous to a "picture," he has opened the door to the view that our perception of physical objects is indirect.

In the light of the above problems, perhaps the most interesting thing about Descartes' theory of vision is that although it so naturally gives rise to the view that we do not "directly" or "immediately" perceive physical objects, Descartes, himself, expresses no doubt that of course we see external physical objects and visually discern their qualities. He does not draw the sharp distinctions between "direct" and "indirect" perception, between "seeing" and "judging" or between "immediate" and "mediated" perception which we find in his successors. His stance is that of the confident realist concerned with how we see objects rather than whether we do, and the facts that some reasoning may be involved in our ability to perceive distance or that the

soul "sees immediately only by means of the brain"[55] do not lead him to question what he takes to be the obvious fact that we see objects and visually discern their qualities. To a certain extent, this may be accounted for by the fact that having been educated within the Aristotelean/Thomistic tradition, he had absorbed a certain almost instinctive realism -- a confidence that of course there are objects and we can know them. This persisted to some extent throughout his life,[56] and certainly characterized his thought at the time he wrote L'Homme and La Dioptrique.

It was, however, not merely habit which prevented Descartes from seeing vision as a process in which we are primarily or directly given only some inner, private object. One very important thing which gave Descartes confidence that we are in direct contact with physical objects in vision, was his theory of light. Although this is, of course, specific to his theory of vision, I believe it very much colors his thinking about perception in general.

Unlike Malebranche and Berkeley (who regarded light as mental or spiritual in nature) Descartes believed that light was a real material thing exerting a pressure upon

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55/ AT VI, p. 141.

56/ For a very interesting study of the persistent strain of realism in Descartes' philosophy, see Brian O'Neil's book Epistemological Direct Realism in the Philosophy of Descartes.

the retina. Vision is thus only a form of touch, albeit an indirect one, in which the light rays are viewed as analogous with the sticks a blind man uses to feel objects. And just as we would say that the blind man is really touching (is in contact with) the object itself and not any copy or representation of it, so also Descartes wants us to think of the perceiver as, in vision, really in direct contact with the object by means of the light rays. This impression of immediacy is heightened also by the fact that he believes that light is transmitted instantaneously.

Indeed Descartes carries the analogy with touch so far that he says that the motions of which the brain image is composed "act immediately against [contre]" the soul. -- a striking attempt to somehow fit the soul in as part of the causal chain in which all action is by impact in accord with the laws of mechanics. All sorts of complications arise when we try to square this with the rather more elaborate mechanics provided in L'Homme, and the problem is further complicated by his his ambivalence (above noted) as to whether the soul can be in the retina to feel the light rays, or whether it can only feel at the pineal gland. Nonetheless the general picture is clear. Descartes' theory of light enables him to assimilate vision to touch, and this has the general effect of making him see vision as providing direct contact with objects. This is, I suggest,

one reason why he clings so stubbornly to the analogy between light and the blind man's stick, even in the face of its evident incompatibility with the particle theory of light he needed to explain colors (as we saw in Chapter III).

Thus the demise of Descartes' theory of light (particularly his view that it was a pressure exerted by the second element particles which were considered to behave like a rigid body) and its replacement with the wave theory of light, undermined one of the bases for Descartes' confidence that we are in direct contact with objects in vision.

In addition to his theory of light, another main thing which distinguishes Descartes' theory of vision from those of Malebranche and Berkeley is his belief in the causal interaction of mind and body. Malebranche's severing of the causal connection between mind and body led him, as we shall see in the next chapter, to see the mind in perception as increasingly closed in upon itself, perceiving directly only its own ideas. Our knowledge of external objects thus becomes, for Malebranche, very indirect -- so much so, in fact, that he holds it is only by revelation that we know that the physical world exists at all. The kind of representationalism we find in Malebranche, thus, is clearly idealist in nature. We directly perceive only something mental.

The question of whether, in fact, Descartes' system was necessarily unable to account for casual interaction between mind and body is one about which considerable dispute exists. Few topics have received as much critical attention as this one, and a resolution of the issue cannot be attempted here It is to be noted, however, that Malebranche's denial of the possibility of causal interaction of mind and body led him, and those who followed him, to increasingly see ideas as themselves the objects of perception.

To the extent that Descartes could be said to hold a representational theory of perception in L'Homme and La Dioptrique, it is a representationalism in which the pineal gland image represents the object and not an idealist one in which the mind perceives directly only a mental copy or image of the object.[57/] We perceive sensations and not

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57/ Descartes does, in several passages use the term "represent" to describe the relation between the brain image and the object. See Dioptrics, Discourse IV, where in speaking of the images ["images"] transmitted into our brains, he says: " ... there are no images which must in all ways resemble the objects which they represent." (AT VI, p. 113, Olscamp, pp. 89-90) He goes on to say that "in order to be more perfect as images and to represent an object better, they must not resemble it ...[as much as they might]" In the Passions of the Soul, also, he says that "it is not the movements which are in the eye, but those which are in the brain which represent these objects to the soul." [AT XI, p. 338] Kemp Smith also reads Descartes as holding this sort of representationalism. He says that while Descartes "still advocates
(Continued next page)

motions in the brain because God joined those sensations to those motions, but it is really that brain image, causally connected as it is with the physical object, which is acting directly upon the soul to cause the sensations. Vision is like being poked with a stick, as we saw above, and Descartes thus does not naturally think of ideas as being "terminated within themselves" (to borrow Berkeley's phrase).[58] Instead the mind is directly connected with all the things which form part of the causal chain -- extending from the pineal gland surface back to the object.

Another aspect of Descartes' theory of vision which separates him from Malebranche and Berkeley is his belief in the quasi-substantial union of soul and body, and the way this leads him to speak of the soul being able to be present in the hands or eyes and to direct its attention out from them to know (connaitre) the place where the object is. The soul's purported ability to do these things is not explained. But to the extent that the soul is not confined to the pineal gland, one of the main reasons for

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57/ (cont.) a doctrine of representative perception, the correspondence to be established is no longer between objects, assumed to be mental, and physical bodies, but between brain patterns (ideas corporeas) and the distant bodies mechanically generative of them ..." (Kemp Smith, New Studies in the Philosophy of Descartes, p. 147.)

58/ New Theory of Vision, §79, Luce Translation p. 203.

representationalism disappears. Neither Malebranche nor Berkeley believe in the sort of intimate interweaving of body and soul which Descartes espouses, but rather see the soul as in a very close relationship with God and only a very indirect one with the body or any other material thing (with Berkeley, of course, holding that there are no material things).

Summary

Descartes' theory of vision, then, as we have seen, left a number of interesting and thorny problems for his successors to wrestle with. Besides the purely scientific question of the accuracy of his physiology, there were a host of problems involving what the real nature of colors is, by what "means" we perceive situation, distance, size and shape, the role of judgment in visual perception, and how the soul relates to the retinal or brain images. And interwoven with these problems were the metaphysical problems of mind/body interaction and the epistemological problems of the reliability of the knowledge of the external world which we obtain from perception.

We turn now to consider the way in which Descartes' theory of vision evolved in an increasingly idealistic direction as Malebranche, Locke and Berkeley struggled with the problems he left behind.

FIGURES

Figure IV-1

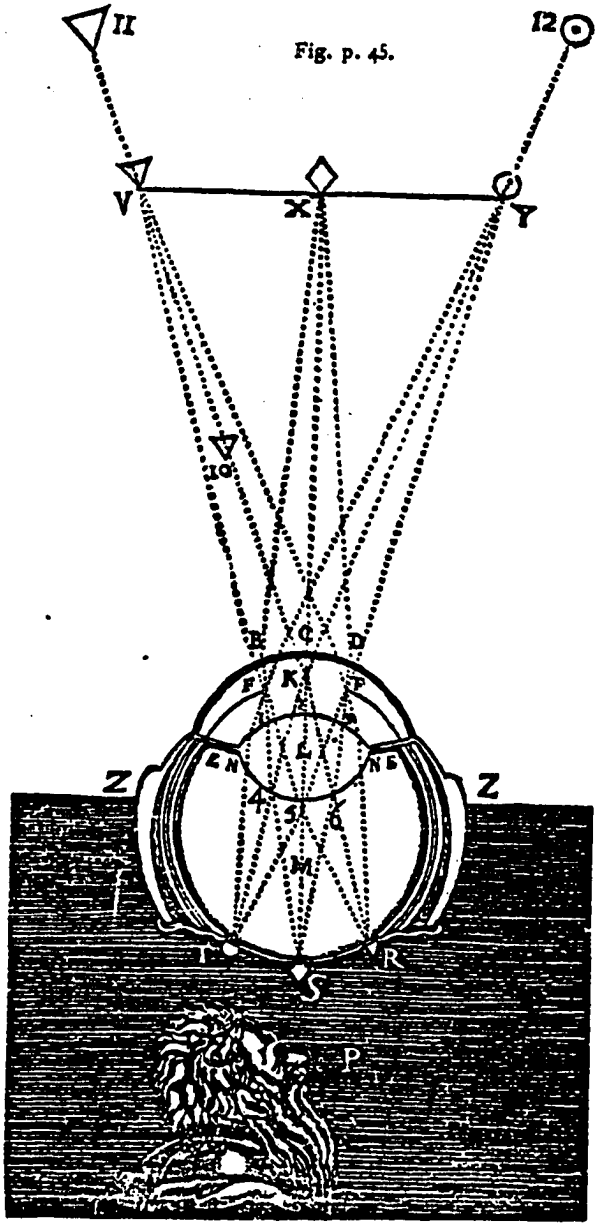

Figure IV-2

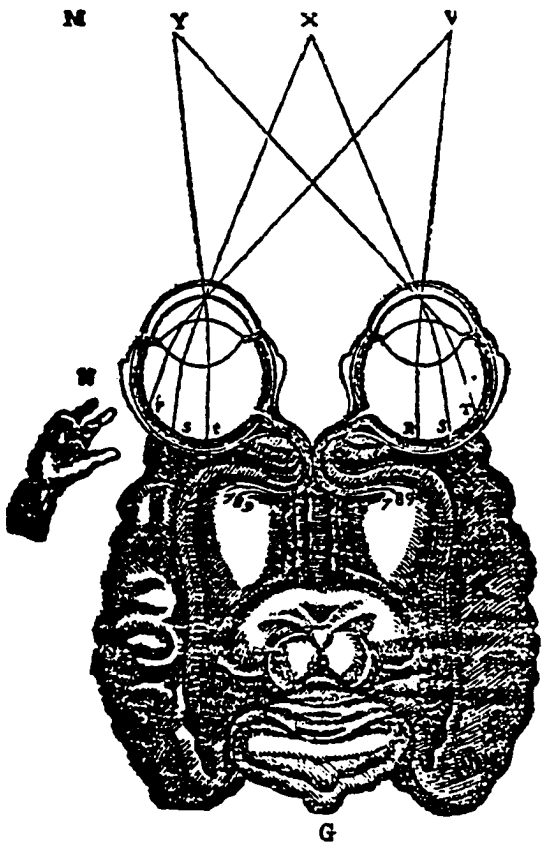

Figure IV-3

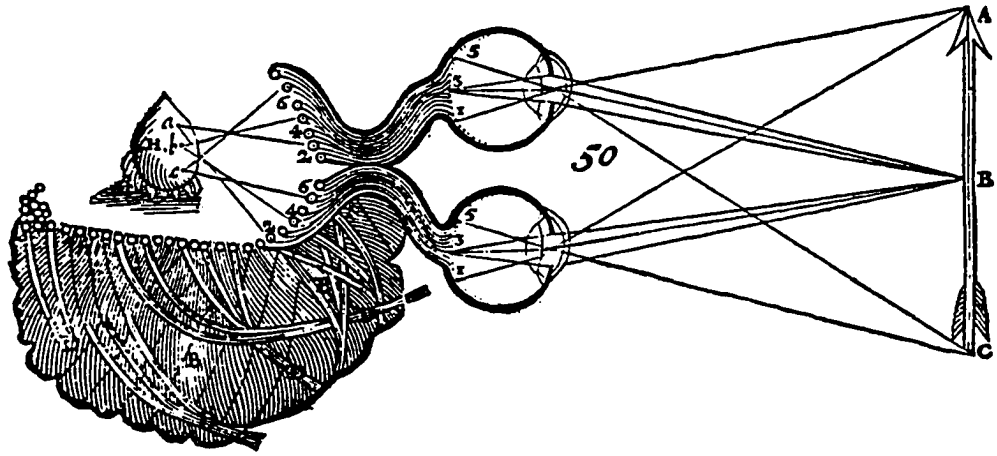

Figure IV-4

CHAPTER V
THE EMERGENCE OF PERCEPTUAL IDEALISM

We have completed our study of Descartes' theory of perception, in particular visual perception, and of the way in which his account of these involved very significant departures from the traditional Aristotelean one. The purpose of this concluding chapter will be to trace the way in which Descartes' theory of vision evolved through the work of his successors in an increasingly idealistic direction, and to isolate some of the elements of the Cartesian theory which led toward idealism. No claim is made that the sort of perceptual idealism we find in Berkeley is an inevitable outgrowth of the framework Descartes set up for explaining vision, but it is hoped that the brief account provided here will show that perceptual idealism did, indeed, flow logically and naturally from it, and that it could not have arisen without the changes Descartes had made in the Aristotelean system.

Since an in depth presentation of Malebranche's, Locke's and Berkeley's theories of perception would go beyond the scope of this essay, several main strands of thought which run through the work of these philosophers have been selected for discussion. The first one, which can be seen to grow out of Descartes' real distinction of mind and body, is the whole issue of the nature and

ontological status of ideas and of the way in which these came, increasingly, to be seen as inner, mental objects of perception. The other two are more specific to vision, namely (1) the increasing subjectivization of light and colors and (2) the increasingly sharp distinction between seeing and judging which arose in the course of Descartes' successors' attempts to explain visual spatial perception. These latter two trends in the theory of vision grew, to a large extent, out of Descartes' physiology and his physics. There is, however, as we shall see below, considerable interaction between what we would now call scientific considerations and what we would call philosophical issues, since Descartes, himself, did not sharply separate the two.

These three strands of thought, then, are woven together by Berkeley to create the sort of subjective idealism of vision which we find in the Essay Towards a New Theory of Vision (hereafter NTV), according to which what we see has no existence outside our own minds.

We shall begin with Descartes' successors' struggles with the nature of ideas -- their ontological status and their relation to the perceiving mind, since the issues involved here affect questions at issue in the controversy over the nature of colors. We shall then discuss the subjectivization of light and colors in Part II and the

emergence of the seeing/judging distinction in Part III, concluding in Part IV with a discussion of the way in which Berkeley integrated all these strands in his argument in the New Theory of Vision.

PART I

METAPHYSICS AND THE THEORY OF IDEAS

Descartes' ontology divided all reality into extended bodies and their modifications on the one hand, and thinking substances and their modifications on the other. He denied that there was a real distinction between the mind and its modifications,[1/] so that it would seem to follow that in perception we are only in contact with our own mind modified in this or that way, and thus with something mental and merely subjective.

One way in which Descartes strove to avert this sort of subjectivism was the distinction he drew between the formal reality of an idea and its objective reality. The formal reality of an idea is merely its existence as a modification of my mind, and all ideas thus possess the same amount of formal reality. If this were the only kind of existence ideas possessed, however, Descartes' Third Meditation argument for the existence of God would not work, for from a finite effect (the modification of our finite mind) we have no right to conclude to the existence of an

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1/ See Principles I, LX, LXI-LXIII.

infinite cause.[2/] Thus Descartes brings in the notion of the "objective reality" of ideas. The objective reality of an idea is the reality it has by virtue of what it represents, and objective reality belongs to an idea so truly that a cause of equal or greater formal reality must always be found to account for it. Thus God must exist to account for the fact that we have an idea of him.

The imporant role which Descartes assigned to the pineal gland image in vision also affected the way he understood ideas. As we discussed in Chapter IV, one very plausible interpretation of Descartes' theory of ideas is that in perception, at least, the mind is immediately considering a physical pattern of motions in the pineal gland or of open and closed tubules in the brain, but experiencing them as the sensations God has joined to them. The immediate object of the mind is thus not mental but physical.

Malebranche

Malebranche rejected the view that there is any causal interaction between mind and body, and did not find the doctrine of the "objective reality" of ideas to be an acceptable solution to the problem of how ideas could be

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2/ Malebranche makes this very criticism of Descartes' Third Meditation argument in his "Reponse a la troisieme letter de M. Arnauld, cited in Cress, "The Immediate Object of Consciousness in Malebranche", p. 363, fnte. 15.

more than mere subjective modifications of the mind. While he conceded that our sensations (or "sentiments" in french) were merely subjective modifications of our own soul (as we shall see below in discussing his treatment of light and color) the same was not true, he thought, of our "ideas". These he took to be located in the mind of God. In fact one way of looking at it is to say that Malebranche took what Descartes had called the "objective reality" of ideas and placed it in the mind of God.[3/] In normal visual perception, then, we experience the color of the rose in our own mind (that is where it is) and its shape in God. Our soul is intimately united to God at all times, and He discloses to it His own ideas -- the Divine archtypes from which all of creation proceeds -- as He sees fit.

Although very few philosophers followed Malebranche in the view that we see all things in God, his theory was still extremely influential and had an important impact upon the British Empiricists. Interestingly enough, his distinction between sentiments and ideas, important as it was to him, was not the aspect of his thought which was preserved by Locke and Berkeley. They were influenced more

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3/ Malebranche explicitly criticizes Descartes for failing to distinguish clearly enough between the ideas themselves and their being as modalities of the soul. He identifies his own use of the term "idea" with Descartes' "objective reality". See Bracken, Harry. "Berkeley and Malebranche on Ideas", The Modern Schoolman, Vol. XLI, Nov. 1963, pp. 4-5.

by those features of his theory which led Malebranche toward the view that there must be some sort of inner entity which represents objects to the soul. We will begin, then, by looking at these features of his theory, and then look more carefully at the reasons why Malebranche found it necessary to draw such a radical distinction between sentiments and ideas. This will then put us in a position to understand Locke's rejection of the distinction between sentiments and ideas and what that implied.

One thing which led Malebranche to see ideas as the immediate objects of perception (rather than physical objects) was the seriousness with which he took the Cartesian doctrine that the soul is localized at, and interacts with the body only at the pineal gland.

> ... our souls do not leave our bodies to measure the vastness of the heavens, and consequently we cannot see external objects except by means of ideas which represent them. [Recherche de la Verite (hereafter Recherche), III, II, Ch. I, §I, Rodis-Lewis Vol. I, p. 417]

The other major thing which led him to see ideas as the immediate objects of perception was his occasionalist solution to the problem of mind/body interaction, which made of the physical and the mental two wholly distinct realms, hermetically sealed off from each other, running parallel to each other only through the constant intervention of God. If, as Malebranche believed, physical bodies

cannot act upon the soul at all, then it becomes natural for ideas to come more to the forefront as, themselves, the objects of perception.

Ideas, thus, come to be seen as things in their own right.

> Even it it were true that ideas were little things worthy of being despised, they are nonetheless things (etres) and spiritual things. [Recherche, III, II, Ch. III, R-L Vol I, p. 423.

People are ordinarily more certain of the existence of physical things than the existence of ideas, which they unthinkingly regard as mere nothings. But, Malebranche says, this is wrong, for we can often be mistaken about the existence of a physical object, but the idea necessarily exists whenever we perceive, and is just as we see it to be. Furthermore, ideas have properties. Our idea of a square is different from our idea of a circle, and a mere nothing cannot have properties.[4/]

Malebranche, however, was too subtle a thinker to fall into a facile representationalism in which all we perceive is on the exact same footing. Although in some earlier editions of the Recherche he tended to use the term "idea" as Locke does to cover whatever we perceive immediately, in his more mature work he is careful to distinguish between

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4/ Recherche. III, II, Ch. I, §I, R-L Vol. I, p. 414-415]

those components of our perceptual experience which inform us of something outside us (thus requiring mediating ideas) and those which do not, namely sensations.[5/] He also gave considerable thought to the genesis of ideas and to what it could mean for an idea to be in the mind, and concluded that our clear and distinct ideas could only be perceived in God who discloses them to us.

A thorough discussion of all the arguments which led Malebranche to his theory of the vision of clear and distinct ideas in God would go beyond our purposes here. We will, then, merely summarize what the difference is between ideas and sensations, and then offer a few of Malebranche's reasons for supposing that the ideas must be perceived in God.

Sensations (or sensible perception) include basically all that we perceive through the senses, such as odors, colors, sounds, heat, etc. They are obscure and confused -- a kind of confused self-awareness or interior feeling -- by contrast with pure perception which is of clear and distinct ideas. Sensations are perceived in a different way from ideas. They penetrate the soul. In Eclaircissment XI he puts the point quite forcefully:

> ... the soul becomes actually blue, red and yellow, and is tinted with all the colors of

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5/ For a discussion of the development of Malebranche's use of the term "idea" see Connell, The Vision in God, pp. 44-45.

> the rainbow when she considers it.... when one smells carrion, the soul becomes formally stinking. [R-L Vol. III, p. 166]

Ideas, by contrast, affect the soul in a more superficial way.[6/] Connell expresses this difference very well:[7/]

> In sensible perception [sensation] the soul is so deeply affected that its awareness is completely occupied with itself as thus affected, the whole content of its perception is this consciousness of itself. In pure perception [ideas] on the other hand, the mind opens out to an idea that represents to it something other than its own subjective state.

Our experiencing of both sensations and ideas is the result of God's action upon our souls (since material objects cannot causally affect us). However, Malebranche, for a number of reasons, believes that the ideas we experience are actually the ideas in God's mind. On the most general level we could say that he resorts to this solution because he finds the alternative hypothesis they are in our minds unacceptable.

The main reason he finds it unacceptable is because our minds are finite and particular. Thus it would seem that all modifications of our mind would also be finite and particular. However we have general ideas and ideas of the

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6/ Recherche, R-L Vol. I., pp. 41-42

7/ Connell, op. cit. p. 43

infinite. Hence these cannot be mere modifications of my mind.[8/] (It must be remembered that for Malebranche the modifications of a substance are merely that substance itself existing in this or that manner.[9/]

The vision of clear and distinct ideas in God also helps Malebranche explain how an unextended mind can know extended things. For God is unextended, and in his mind are found the archtypical ideas from which all creation flows. Since we are spirit and God is spirit it seems easier to Malebranche to suppose that we know objects through God's ideas.[10/]

Another, and for Malebranche a very important reason for the view that we perceive things by the mediation of God's ideas, was because he thought that Descartes' view of the relation of the soul to its modifications led toward a

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8/ See "Reponse au Liver de M. Arnauld, Des vrayes et des fausses Idees, cited by Cress, "The Immediate Object of Consciousness in Malebranche", p. 360, from 20-vol. Robinet edition of Malebranche's works, Paris. J. Vrin, 1958-67. Vol. VI, p. 60. See also Recherche, III, II, VI, R-L Vol. I, p. 441 and Eclaircissment X, R-L Vol. III, p. 149 on why general ideas cannot be in the mind.

9/ Recherche, R-L Vol. I, p. 462

10/ The question, then, arises, of course, of how God can have ideas of extended things since He is not extended. In answer to this Malebranche develops a theory that what we find in God's mind is "intelligible extension" rather than physical, and it is not clear why he did not, as Berkeley did, adopt this solution in the case of the human mind.

placing of the self in the place of God. For if all our ideas were merely modifications of our soul, and there is no real distinction between a substance and its modifications, then the soul basically knows all creation in contemplating itself. (The problem becomes especially acute as Descartes moves toward supposing all ideas to be innate.) Only God, according to Malebranche, can know all things in contemplating Himself, for they all flow from Him. But the same is not true of finite, created intelligences, and to suppose we can know all by contemplating our own soul and its modifications would be wrongly putting the self in the place of God.[11]

Finally, Malebranche believed he had proved, by means of his elaborate argument by elimination in the third book of the Recherche, that all alternative accounts of how we perceive are untenable. (He provides arguments against the views that ideas come from the external bodies, that our soul has the power to produce them, that they are all innate, that God produces them each time we think of them, or that the soul has within herself all the perfections she perceives in objects.)[12]

11/ Recherche, R-L Vol. I, p. 434-35

12/ Recherche, R-L Vol. I, p. 413.

Summary

With the work of Malebranche, then, certain tenets central to perceptual idealism have emerged. Physical objects are never directly or immediately perceived. Instead the mind, in perceiving external objects, is immediately united only with ideas, and these ideas are viewed as mental or spiritual in nature, and as being real beings or things (albeit not substances). His theory that we see all things in God, by means of the Divine ideas, however, provided for a certain objectivity to our knowledge enabling us, as it were, to get outside our own mind. And if looked at from within the Thomistic framework, access to the ideas in God's mind would give us a very real access to physical things since these flow from God's ideas. One could almost say that we see things through God's ideas rather than that we merely see God's ideas.

Locke

John Locke was a philosopher of a wholly different turn of mind from Malebranche, and approached questions concerning human knowledge from a psychological perspective rather than a metaphysical one. While breaking down the distinction between sentiments and ideas, and applying the term "idea" extremely broadly to all we perceive, Locke himself professed an agnosticism about the nature of ideas, at least if by "nature of ideas" is meant anything beyond

what I know about my own ideas from experiencing them. His way of using the term "idea" was regarded by his contemporaries as very novel,[13] and the philosophical currency which he gave to the term did much to pave the way for Berkeley's use of it in the New Theory of Vision.

In his essay "An Examination of P. Malebranche's Opinion of Seeing all things in God" Locke gives several reasons for his rejection of Malebranche's distinction between "sentiments" and ideas (he uses the term "sentiment" untranslated because he professes not to understand it and hence not to be able to translate it).

First, if we accept the definition of "idea" as "the immediate or nearest object of the mind when it perceives any thing"[14] (a definition which he attributes to

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13/ An interesting discussion of Locke's contemporaries' reactions to his use of the term "idea" is found in Yolton's John Locke and the Way of Ideas. Stillingfleet, for example writes, "... your way of certainty by ideas is so wholly new, that here we have no general principles, no criterion ..." (p. 89) Sergeant writes, "In a word, since ideas are both unintelligible and altogether useless, and (I fear) ill use is made of them, contrary to the intention of their authors; it seems but fitting that the way of ideas should be laid aside; nay that the very word which has got such a vogue, should be no longer heard of." (p. 90-91) Locke's use of the term was thus seen as either a rather dangerous novelty, or a "cheap and easie way, some men nowadays have taken up, of appearing wise and learned..." (p. 88)

14/ "An Examination of P. Malebranche's Opinion of Seeing all things in God", Vol. IX, p. 234.

Malebranche) then Locke confesses himself at a loss to understand what a "sentiment" can be. If ideas are objects of perception, it would seem that the only thing left for sentiments to be is the "act of sensation or the operation of the soul in perceiving".[15] Since Locke (unlike Malebranche) is clearly working with an act/object model of our inner life there is nothing else sentiments could be. And if the act or operation of the soul is what is meant, then that act is the same whether we are perceiving the smell, color or shape of the rose.

Secondly, if the distinction between sentiments and ideas lies in the fact that the latter are clear and distinct while the former are obscure and confused, Locke finds that introspection does not bear this out. When he considers his idea of a violet, for example, he finds that he has just as clear an idea of its purple color as he does of its shape.[16]

And since we perceive the color, the odor and the shape of the object together, he sees no reason why "the action of one of our senses is applied only to God, when we use them all as well as the eyes in receiving ideas."[17]

15/ Op. cit. p. 232.

16/ Op. cit. p. 233.

17/ Ibid.

Next he spends several pages attacking Malebranche's notion of a "modification". Sentiments, as we saw above, were conceived of by Malebranche as mere modifications of the soul, while ideas were something more than this. But Locke, again applying his introspective method, finds he really has no understanding of what a "modification of my soul" could be, above and beyond the fact that I now have, for example, the idea of purple in my mind which I had not some minutes ago.[18] However, if this is what is meant, then it would seem that my mind also undergoes a modification when I now perceive the figure of the violet which I did not before. Thus all we perceive involves equally a modification of our mind, and no distinction on this point can be drawn between a sentiment and an idea. He also raises problems with how the mind which is supposed to be indivisible can have numerous (e.g. color, smell, sound etc.) and sometimes inconsistent (e.g. white and black) modifications at the same time.

If, then, we follow Locke in his rejection of Malebranche's theory of perception, we are left with the view that all we immediately perceive is equally to be classified as an "idea", be it color, shape, or even pain or joy.

18/ Op. cit. p. 234.

In fact he generalizes this in the Essay to include all our thinking:

> Since the mind, in all its thoughts and reasonings, hath no other immediate object but its own ideas, which it alone does or can contemplate, it is evident that our knowledge is only conversant about them. (IV, I, 1]

These ideas, he tells us, are confined to those simple ideas which enter the mind through the outer senses or through inner sense, which Locke calls "reflection", and the complex ideas which our mind constructs out of these. The senses are consistently spoken of as "conveying" ideas into the understanding"[19]/or as "inlets", as something by which ideas "come into our minds", or "make their approaches to our minds".[20]/ The organs or nerves "are the conduits to convey them [tastes, smells, noises, colors, etc.] from without to their audience in the brain -- the mind's presence room."[21]/

Ideas can, thus, be classified according to the sense through which they come to us -- that is to say by their causal origins. Thus he speaks of ideas of touch, ideas of hearing, or ideas "received by" a particular sense, and of

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19/ IV, XI, §9

20/ II, III, §1

21/ II, III, §1, p. 148-9

certain ideas "coming in by the eyes".[22] He speaks of "ideas of one sense", and of ideas "belonging to the touch".[23] Although these ways of speaking anticipate Berkeley's use of the terms "ideas of sight", "visible ideas", and "ideas of touch" in the New Theory of Vision, it is important that Locke's classification is merely based on causal origin, and in no way signifies that ideas of sight and ideas of touch form two metaphysically distinct kinds of ideas (as they do for Berkeley).

Indeed, unlike both Malebranche and Berkeley, Locke avoids as much as possible any discussions of the metaphysical status of our ideas. He professes ignorance about what our ideas are "any further than as they are perceptions we experiment within ourselves."[24] He also professes ignorance about how our ideas are caused or produced in our minds, above and beyond the way in which objects operate upon our senses, nerves and brain. He believes that the motions conveyed to the brain do cause our

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22/ II, III, §1

23/ II, III, §1

24/ Remarks upon Mr. Norris' Books, etc. wherein he asserts P. Malebranche's Opinion of Our Seeing all things in God.", Vol. X, p. 256.

ideas, but "in a manner to me incomprehensible" and accountable for only by the "good pleasure of God."[25]

Summary

With Locke's rejection of the distinction between ideas and sensations, and of the theory that we perceive external objects by being united with God and perceiving them by means of the Divine ideas, we have come a step closer to perceptual idealism. The vision in God did, as we saw above, guarantee a certain objectivity for our knowledge of external objects; it enabled us to get outside our own minds. But on Locke's view the mind's knowledge is conversant only about "its own ideas".[26]

Since Locke, unlike Berkeley, was agnostic about the ontological status of ideas, he did not conclude that all we perceive is mental in nature. However, his imposition of an act/object model on our inner life and his broad use of the term "idea" to apply to everything we perceive opened the way to Berkeley's idealistic interpretation of vision, as we shall see below.

25/ "Examination of P. Malebranche's Opinion ..." AT Vol. IX, p. 217.

26/ IV, I, §1.

PART II

THE SUBJECTIVIZATION OF LIGHT AND COLOR

With Malebranche's work, the idealism about colors which had been latent in Descartes' theory came to a full flowering. This subjectivization of light and color was a very important philosophical development, for it involved the demise of something quite central to the Aristotelean system, the doctrine of the reality of the qualities which our senses reveal to us. The whole thrust of Cartesian physics, as we saw in Chapter III, was toward driving a wedge between sensible qualities as experienced by us and the qualities taken by physics to be really properties of the object, such as extension, figure and motion. The view that there is nothing out there in the world except geometrical properties and motion really leaves no place for colors to be except in the mind (unless, of course, we identify them with a configuration or motion of extended particles of matter). There were, however, several things which tended to prevent Descartes from making strong pronouncements to the effect that colors exist only in the mind.

One reason was clearly political. Such a view would have aroused strong opposition from the Aristoteleans whom he wished to placate. Hence we find him in the Sixth

Meditation stating merely that we cannot know that there is something like our sensation of white or green in the objects[27] -- the same point we found him making in the first ten pages of Le Monde.[28] As he wrote to Regius in 1642, he preferred not to openly deny substantial forms and real qualities, but instead to say only that he finds it unnecessary for his purposes to assume them.[29] It is thus more in his later works, after he has given up hope that the Jesuits will accept his philosophy, that we find him openly denying colors any extra-mental existence.[30]

The second reason was that Descartes continued to insist throughout his life that there is real causal interaction between the mind and the body, and this made it natural for him to apply color terms all along the chain -- to the configurations of particles on the surfaces of bodies, and to the spinning motions of the light particles as well as our sensations.

27/ He lists under "inconsiderate judgments" we are in the habit of making the opinion that "in a white or green body there is the same whiteness or greeness that I perceive." [H.R. I, p. 193]. We know there is a difference between the object that causes us to see green and the one that causes us to perceive white, but we cannot assume that what is in the object is like our sensations.

28/ See discussion in Ch. III, pp. 127-130

29/ AT III, p. 492.

30/ See, for example, Principles of Philosophy, Part IV, No. 197, Notae in Programma, AT VIII, pp. 358-9.

In terms of our interest in the emergence of perceptual idealism, Malebranche's work is of the greatest importance. Locke to some extent went along with Malebranche's subjectivization of colors, but he also reverted back to certain aspects of Descartes' theory and did not hold to a consistently idealistic understanding of colors. We shall therefore focus mainly on Malebranche.

Malebranche

Malebranche, like Descartes, did considerable scientific work on light and color. Indeed, his work in this area was of very high quality and enduring importance.

A. Scientific Work

Like his master, Descartes, Malebranche had a great interest in the physics of light and color. Unlike Descartes, however, he was quite willing to be instructed by the work of others and freely acknowledged his debt to them. His thought on light and color developed through three phases: the first is purely Cartesian, the second involves his attempt to come to terms with the work of Huygens, and the third is in response to his reading of Newton.[31/]

31/ This general way of breaking down Malebranche's work on optics into three periods is taken from Mouy's account in Ledevelopment de la physique Cartesienne, p. 304-310.

In the first four editions of the Recherche, Book VI, Ch. II, part IV, he held to the theory that light is a pressure exerted by the second element particles, that it travels instantaneously and that if a body reflects light without modifying its rotary motions we see white, if it absorbs it we see black, and if it reflects the little balls in such a way as to modify their spinning motion, we see various colors.[32/]

The second phase of his thought reflects the impact upon his thought of his reading of Huygens. This appears in the first two editions of the Entretiens sur la Metaphysique et sur la Religion (1688, 1690),[33/] in a special paper he did for the Academy of Science in 1699 "Reflexions sur la lumière et les couleurs et la generation du feu"[34/] and the XVIieme Eclaircissment to the fifth edition of the Recherche. Huygens, according to Mouy, was the best of the Cartesian physicists, among other things because he liberated Descartes' physics from its undue reliance upon easily visualizable models and geometric constructions, by relying more upon mathematical calculation

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32/ See Mouy, op. cit., p. 305.

33/ Ibid.

34/ Duhem, Pierre, "L'Optique de Malebranche, Revue de metaphysique et de morale, 1916, p. 76.

than imagination, and Malebranche was alone in his appreciation of the importance of Huygens' work.

It had become clear to Malebranche that Descartes' theory was untenable. First of all Huygens had determined experimentally that the velocity of light was not infinite. And secondly he found it impossible to understand how light rays could cross without becoming confused if, as Descartes said, the color is determined by the spinning motion of particles. If two rays pass through the same point at the same time, the same particle cannot have two different rotary motions at once.[35/]

In response to these and other objections to Descartes' theory of light and color, he developed a theory according to which the second element (the ether) was no longer supposed to be composed of rigid particles, but rather of elastic ones. Through Huygens' inspiration, he moved toward a wave theory of light. His most important contribution was the drawing of the comparison between sound and light (an analogy which has been extremely fertile for modern physics) and the way in which he evolved a theory of color based on this. Briefly stated, his view is that:

> ... the different colors consist only in the different frequency of the vibrations (variations of pressure) in the subtle

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35/ Eclaircissment XVI, R-L, Vol 3, p. 263

> matter, as the different tones in music come from the frequency of the vibrations of the gross air ... [XVI Eclaircissment R-L III, p. 266]

Color is like sound, then, in that the frequency of the vibrations or variations of pressure in the medium determines the color seen as the frequency of vibrations determines the pitch of a sound. Malebranche's theory, thus, is, as Duhem argues at great length,[36] both original and closer to the now accepted theory of color than Newton's was, for Newton believed it was the amplitude and not the frequency of the vibrations which determined the color seen. The amplitude of the vibrations determines, as Malebranche correctly pointed out, the brightness or force of the colors only.

The final stage in the development of Malebranche's theory of light and color emerges in the 6th edition of the Recherche and in the 16th and 17th Eclaircissment published with it, and reflects his reading of Newton's Optics in 1706. He was unmoved by Newton's arguments against the wave theory of light, but did alter his explanation of the color white. Whereas he previously had understood it to be a homogeneous color like red or yellow (the color with the highest frequency of vibration) he now followed Newton's view that it is a composite color resulting from the

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36/ See generally "L'Optique de Malebranche". Comparison with Newton is on page 67.

combination of all the other colors, and devised an experiment to prove this.[37]

Malebranche's work on light and color, then, was comparable with that being done by the best scientists of the time, and his work on color especially was original and important.

B. Philosophical Theory of Color

Although Malebranche does sometimes slip into speaking as though his physics tells us what colors are (as he does in the quotation above), he is usually careful to explain that what physics tells us about is the "natural causes" of light and color,[38] or their occasional causes, sometimes called "la lumiere corporelle". But light and color themselves are phenomena in the spiritual rather than the physical realm.

1. Light and Colors in the Soul Only

The main reason for denying that light and colors are properties of material objects is that when we examine closely our idea of extended substance, we find that all we clearly and distinctly perceive to belong to it is rest, movement, and an infinity of different shapes,[39] and not

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37/ See Mouy pp. 308-310.

38/ R-L III, p. 255

39/ Recherche, Book I, Ch. X, §1.

the sensible qualities like colors, odors, pain, heat, etc. "Reason teaches us that they [light and colors] are not found in the idea which we have of matter."[40/]

It is not possible that the sensible qualities which we perceive could, unbeknownst to us, really be identical with, say, motions of the light particles:

> ... a peasant, for example, sees colors perfectly well, and he distinguishes them from all things which are not color. All the same it is certain that he does not notice any movement either in the colored objects or in the bottom of his eye. Therefore color is not movement... For there is no other reason for saying that a square is not a circle than because the idea of a square is different from that of a circle, and that one can think of one without thinking of the other. [R-L, Vol. I, p. 141]

This argument is an interestingly Cartesian one, for in the Cartesian framework being able to separate two things in thought -- i.e. to think of one clearly and distinctly without thinking of the other -- suffices to prove that they are in fact distinct things, since whatever we can conceive clearly and distinctly can be created by the omnipotence of God.

Light and colors, then, are in the soul only, being modifications of a spiritual substance. Her own sensations "belong to" the soul.[41/] Whiteness, he tells us, is not

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40/ R-L Vol. I, p. 139.

41/ Recherche, R-L, Vol. I, p. 137.

located in the paper we look at; it exists only in the soul ("uniquement dans l'ame")."[42] Light and colors cannot exist ouside the soul "for it is a contradiction to suppose that the mode of a being can be where that being is not."[43] Because of original sin, the soul has become so confused and entangled with sensible things that she fails to properly distinguish what belongs to her, but rather:

> ... spreads herself out on all the objects she considers, stripping herself of that which is her own in order to clothe them with it. [R-L, Vol. I, p. 138]

We "take off the light and colors from our own souls" in order to clothe external objects with them.[44] It is thus because our soul is so sensualized by original sin that we discover that our sensations are in our soul at first by the indirect route of discovering that they are not in objects.

Since they are sensations in our own soul we know colors in an immediate manner whenever we sense them.[45] This is why we cannot explain what light and colors are to a blind person; they are only known in the experience of

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42/ Reponse a Regis, in F. Francis Bouillier edition of the Recherche de la Verite, Paris: Garnier, Freres, 1880,1910 Vol. II, p. 240.

43/ R-L, III, p. 95, Entretiens.

44/ Recherche, Vol. I, p. 139.

45/ Op. cit. p. 144.

them. They are never, however, known perfectly, and we have no clear and distinct ideas of them. We sense them but do not know them clearly.[46]

2. Colors not Caused by Motions in the Brain

Although Descartes had trouble explaining how the motions in the brain can cause our sensations, and frequently fell back upon explanations which sound very much like that of Malebranche -- i.e. that the motions or images in the brain "give occasion" to the soul to have ideas or sensations,[47] he nonetheless continued to cling to his belief in real causal interaction.

Malebranche, however, rejects the very possibility of material things acting upon the soul, and finds Descartes' explanation quite unintelligible.

> The motions of the brain cannot change themselves into light or into color. For since the modes of bodies are only the bodies themselves existing in this or that manner, they cannot transform themselves into those [modes] of spirits. Entretiens IV, §10.

The motions in the brain, being only modifications of an extended substance, have in fact no power to act at all. Using Descartes' own method of clear and distinct ideas, Malebranche attempts to prove that in fact material

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46/ R-L Vol. II, p. 100, 3-vol. edition.

47/ AT VI, 113, 114; XI p. 149, 151.

things have no power to act causally at all, either on the mind or on other physical objects.

Our idea of extension, when examined carefully, discloses itself to be purely passive, and to attribute to it some sort of mysterious "power" to act would be to attribute to it something of which we have no clear and distinct idea, and which is not reducible to motion, shape or relations of distance. And this he finds repugnant to reason, and tantamount to abandoning the philosophy of clear and distinct ideas.[48/]

Furthermore, since the motions of physical objects often seem guided by wisdom to certain ends, it would be necessary if we assumed them to possess the source or principle of their actions within them, to attribute wisdom to them -- something prone to lead people toward a kind of pagan belief in spirits in nature.[49/]

An argument against all finite causality in general is drawn from the implications of Descartes' ontology. The mode of a substance is not really distinct from that substance; the shape of a body just is that body existing in this shape rather than another. To cause a change in

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48/ Entretiens VII, No. II, (XII 150-1)

49/ See Recherche bk. VI, part 2, Ch. III; XV Eclaircissment (R-L III, p. 209); Conversations Chretiennes I (R-L IV, pp. 21-22); Mediations Chretiennes V, no. IV (R-L X, p. 478), cited in Connell, The Vision in God, p. 38.

the modifications of a body is thus to cause that body itself existing in this or that manner. But only God has this power. Hence only God can cause changes in the modifications of a substance. "Only the one who can give being can give modes of being, since the modes of being are only the beings themselves in this or that way of existing (façons)."[50/]

And lastly the idea of material things acting upon the soul is particularly repugnant to reason. It would violate the Augustinean principle of subordination of being to permit the lower to act upon what is higher in being, for this would subject the higher being to dependence upon it.[51/] To suppose that material objects (including our own body) can act upon us, would, he believes, have disastrous consequences for Christianity, since it would lead us to grow to love and fear them, and be drawn to focus on them rather than on God.

Light and color, then are purely subjective modifications of our souls; they are our soul existing in this or that manner, and thus are wholly mental in nature. Not only are they not to be identified with any configurations or motions of particles of external objects, but they have

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50/ Traité de Morale, Pt. 2, Ch. II, no. VI

51/ See Connell, op. cit. p. 37 and sources cited in footnote 52.

absolutely no connection with anything physical, being caused directly by God on the occasion of motions in our brain. This unbridgeable gulf between the physical and the mental, thus, leaves light and colors squarely in the category of being mental and subjective.

3. The Localization of Colors

If light and colors are, thus, purely subjective modifications of our own souls, the question very naturally arises of why we do not perceive them as being located there. And given that so many of our sensations of all kinds are experienced as localized somewhere other than in the soul, the further question arises of why some are felt to be localized in our body (e.g. pain), others in the air (e.g. light, odors) and still others in the objects themselves (e.g. colors).

As is so often the case with Malebranche, we are given answers to these questions on two quite different levels, the theological and the psychological, and it is not immediately obvious just how these two levels are related to each other. On the theological level, the answer is that if we perceived all our sensations to be located in our soul only, this would not be conducive to the preservation of the body/soul composite, and thus God has attached spatial localization to our sensations. Our feeling pain in our limbs, thus, leads us to move those limbs quickly

away from the cause of that pain so we will not be injured, and our perceiving colors as on objects helps us to distinguish objects from each other, etc.

Are we to say, then, that God simply gives us our sensations together with the appropriate localization in space? At times Malebranche does seem to incline towards this view. At the same time, however, he develops a fairly sophisticated psychological explanation of how the soul makes "natural judgments" about the spatial location of this or that sensation. Some of the factors which influence the soul's judgment about where its sensations are to be localized are the following.

First of all, we have a natural tendency, in our fallen state, to suppose that our sensations are in objects since they do not come to us whenever we will them, and since we easily suppose that there must be something in the "natural cause" just like our sensation.[52] This, of course, is false; the hand which strikes our eyes causing us to see light need not contain light.[53] But it is natural to us to suppose that our sensations are in objects except in certain special cases.

52/ Recherche, I, XI, §III, R-L Vol. I, p. 132. See also pp. 146-7 on role of original sin.

53/ Recherche, part I, Ch. XII, §V (R-L, Vol. I, p. 142.

1. If a sensation is caused in us by the operation of a cause we can perceive, then we do not suppose our sensation to be in it. For example, we do not suppose pain to be in the needle which pricks our finger.[54]

2. If a sensation is particularly forceful and intense we more readily realize it as in us, as is the case with pain and pleasure, or intense heat or cold.[55]

3. If we perceive the agitation of the fibers in our sense organ, as is often the case with touch (e.g. heat, tickling, etc.) we are led to localize our sensation in the sense organ.[56] This tendency is strengthened if we perceive that some change has been produced in the limb -- for example a cut or a burn mark.[57] In vision, however, we do not perceive the agitation of the nerves in our eyes, so that we do not localize colors there although, as he points out (describing Descartes' experiment with the cow's eye), the colors are just as vivid on the bottom of the eye as on the object.

54/ R-L I, pp. 132-133

55/ R-L Vol. I pp. 138-9

56/ Thus if we look at the sun long enough to injure the nerves in our retinae we tend to localize the colors there [R-L, Vol. I, p. 164]. If we feel the shaking of the fibers in our hand (as when we burn it) we localize the pain there.

57/ R-L, Vol I, p. 133

Light and colors, therefore, being caused by imperceptible particles, being weak and languishing sensations which do not strike the soul strongly, and being unaccompanied by awareness of any changes occurring within the eyes, are not recognized as belonging to the soul, nor are they localized in the body, but are rather judged to be in the air (light) or on the objects (color).

This psychological explanation of what factors influence the natural judgments by which we localize our sensations does not fit very easily with his theological explanation. On the one hand he speaks often of "the judgments which our soul makes ...,"[58/] but on the other hand he says:

> We must not imagine that it depends on us to attach the sensation of whiteness to the snow, or to see it as white, nor to attach pain to the pricked finger and not to the thorn which pricks it. All this is done in us and even in spite of us...[R-L Vol. I,p. 133]

He speaks of the natural judgments involved as "judgments of sense", and sometimes as "sensations", or as judgments made so quickly and habitually that they appear to us to be sensations.[59/] Since the topic of natural judgments will be dealt with in more detail in Part III, we will not go

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58/ See, e.g. p. 138 R-L, Vol. I

59/ R-L, Vol. I, p. 130

into it further here, beyond merely noting that it is not wholly clear whether we make these judgments or whether we just experience a kind of compound of sensation plus spatial localization caused directly by God.

Summary

With the work of Malebranche, the subjectivization of colors is virtually complete. They are, he believes wholly mental or spiritual in nature, have no existence outside the mind, and are not even causally connected with any physical objects. His theory of color localization bears this out in a striking way, for without the intervention of "natural judgments" he supposes that we would perceive light and colors to be actually in our souls. Berkeley, apparently, learned a great deal from Malebranche here, as he makes a rather similar argument for his claim that a blind man who suddenly recovered his sight would at first see all things as "in his mind".

Locke

Locke, as we saw in the preceding section, eradicated the ontological distinction which Malebranche had drawn between our ideas as being perceived in God and our sensations as mere modifications of our own minds. He also argued forcefully against any introspectively discoverable difference between our ideas and our sensations, finding his idea of the color of the violet to be just as clear as

his idea of its shape, and the act or operation of the mind in perceiving each of them to be identical. They are, he believed, perceived together, and as located in the same place.

All the same, Locke, like Descartes and Malebranche, subscribes to a metaphysics which requires him to treat our perception of things like colors, odors, sounds, etc. differently from our perception of extension, figure and motion. This is the case because according to the mechanistic science which he accepted, the latter are really features of the objects we perceive, while colors, for example, are not. He thus must evolve some way in his own theory to distinguish between our ideas of sensible qualities and our ideas of extension figure and motion. Since he cannot do so in terms of any introspectively discoverable criterion, or on ontological grounds (as Malebranche had) Locke looks instead to the causes of our ideas and the relationship which exists between our ideas and their causes.

Our ideas in perception are all, equally, caused by the action of the imperceptible particles of bodies upon our senses. The main difference between them, then, according to Locke, is that some of our ideas bear a resemblance to their causes (namely our ideas of primary qualities) while others do not (namely our ideas of secondary

qualities). Our ideas of primary qualities such as extension, figure and motion are thus reliable. They "are resemblances of them [primary qualities] and their patterns do really exist in the bodies themselves."[60] But "the ideas produced in us by those secondary qualities have no resemblance of them [the secondary qualities] at all."[61] Secondary qualities, as they exist in the object, are only "powers" which those objects have, by virtue of the motion and configuration of their insensible parts, to cause our ideas of, say, colors, odors, sounds, etc., and in no way resemble our ideas of blue, sweet, etc.

The framework Locke has set out, thus, does not lead to quite the same idealism about light and colors which we found in Malebranche. Malebranche had, essentially, identified all secondary qualities with what Locke would call our ideas of secondary qualities, and then gone on to insist that this particular sort of "idea" exists only as a modification of my own mental substance, and is thus wholly mental or spiritual in nature. Locke, given his agnosticism about the ontological status of our ideas, does not insist on their mental or spiritual nature. And furthermore, believing our ideas to be caused by physical objects,

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60/ II, VIII, §15, p. 173

61/ Ibid.

he sees colors as having a certain sort of existence in the object, as "powers to produce various sensations in us by their primary qualities."[62] Exactly what a "power" is, is hard to specify, and he seems, at times, to use the term interchangeably with "quality", "accident" or "property". All the same it is clearly not something purely subjective; it is really in the object.[63]

Summary

In terms of our interest in the rise of visual idealism, Locke's thought about colors was important mainly insofar as he, like his predecessors, held that there was nothing resembling our sensations of color out there in the object. Our subjective experience of colors does not correctly inform us about the way the world is. In this he is clearly placing himself in the tradition of the new mechanistic physics rather than the older Aristotelean physics. In the Cartesian framework colors must either be modes of minds (and hence mental in nature) or else be identified with some sort of configuration and motion of the particles

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62/ II, VIII, §10

63/ See, e.g., II, VIII, §23 where Locke refers to "the power that is in any body, by reason of its insensible primary qualities after a peculiar manner" to act upon sense so as to produce ideas of colours, sounds, tastes, etc. (Emphasis added.)

of extended matter. Malebranche chose the first alternative, while Locke tended more toward the second. But neither one accorded colors the sort of objectivity which the Aristotelean theory had.

PART III

SPATIAL PERCEPTION/SEEING AND JUDGING

In the preceding two sections we have traced the gradual emergence of ideas as a kind of inner object of perception, and the growing subjectivism about colors. The strand of thought which we shall be tracing in this section centers around the problems of visual spatial perception. Although Descartes' hypothesis about the projection of the retinal image to the pineal gland went part way toward solving the problem of how we visually perceive those properties of objects which were essential for his physics (figure, extension, etc.) his theory generated as many problems as it resolved.

The complex of problems which it generated involved, first of all, egocentric spatial perception -- namely how far the object is from me (distance) and in what direction (situation). These were problems because the retinal image and its pineal correlate were two-dimensional, and inverted and reversed relative to the object. In addition to these difficulties, however, our perception of size and shape became problematical also, since the retinal projections of objects are subject to considerable perspective distortions, e.g., round objects appearing elliptical and nearby ones many times larger than distant ones. Descartes'

successors, thus, developed various hypotheses about how we compensate for the lacks and distortions of the retinal image so as to correctly perceive how far away objects are, their size and shape, etc.

Our perception of distance, situation, size, shape and motion was taken to be interrelated. A nearby man is not perceived to be larger than a distant one because we perceive him to be closer, and we do not perceive the plate to be elliptical because we perceive it to be tilted away from us, etc. Thus rather than treat all of the various components of the perceptual problems loosely called the problems of "spatial perception", we will select one of them as representative and treat it in more depth. Since it is of special importance to Berkeley's NTV, we have selected our perception of distance for discussion.

Descartes had attempted to solve the problem of distance perception by hypothesizing various corrective mechanisms. Some of these functioned merely due to the fact that changes in the positions of the nerves in the eye muscles caused changes in the brain which acted directly upon the soul, such as for example changes in eye shape. Others involved more of a reasoning process on the part of the soul, like the "natural geometry" theory. Descartes, however, did not make a great deal of this difference, and tended to speak of all we can discern using our eyes as

"seen" whether or not there was any element of reasoning or judgment involved.

Malebranche

Malebranche, it is clear, accepts the basic core of Descartes' theory of vision, according to which the retinal images are projected to the pineal gland where they are merged and act upon the soul. (It must, of course, be understood that such motions are merely the occasional causes of our ideas.) This is essentially a camera model in which the soul is passively affected by the pattern of motions in the pineal gland so that unless something intervenes, our visual experience would be just like the projection on the retina. A man, for example, would be seen to double in size as he approached. His discussion of our perception of a cube is particularly illustrative of how Malebranche is thinking.

> When we look at a cube, for example, it is certain that all the sides of it which we see, almost never make the same size projection or image on the bottom of the eye; since the image of each of the sides which is painted on the retina or optic nerve, is very like a cube painted in perspective: and consequently the sensation which we have of it ought to represent to us the sides of the cube as unequal, as in a cube in perspective. However, we see them all as equal and are not mistaken. [R-L, Vol. 1, p. 96]

What is it, then, which prevents us from seeing the sides of the cube as unequal?

> One could say that this happens by a sort of judgment which we make naturally, namely; that the faces of the cube which are most distant and which are seen obliquely ought not to form as large images on the bottom of our eyes as the faces which are closer. (R-L, Vol. I, pp. 96-97)

These "natural judgments" are, thus, virtually ubiquitous in perception, and without them we would almost always be mistaken.[64/] If we examine Malebranche's theory of natural judgments from a purely psychological point of view, he has a great deal to say (some of it quite original and still highly regarded by psychologists)[65/] about the cues or "means" by which we make judgments about the distance, size, etc. of objects. He considers why we are right when we are right and why in some cases we are mistaken. He is especially interested in optical illusions and attempts explanations of some of them, for example the problem of why the moon looks larger at the horizon.

The psychological account of the various means by which we are enabled to make natural judgments about the motion, size, shape and distance of objects, is found mainly in the Recherche. Although Cartesian in spirit,

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64/ R-L, Vol. I, p. 97

65/ See, for example, Pastore, Selective History of Theories of Visual Perception, Ch. III. He finds Malebranche's work "important" particularly in its detailed attention to visual facts and his work on optical illusions.

there are certain subtle but important changes from Descartes' theory as we shall see.

One cannot, however, read Malebranche's work on vision from an exclusively psychological point of view because theological considerations are closely interwoven with, and exist in a certain tension with, psychological ones. This is because as he develops his theory of natural judgments it becomes obvious that the complexity of the calculations the soul would have to make in order to get from the retinal image to the real size, shape, motion and distance of the object would be so great as to exceed the power of the finite mind. Hence it must be God who makes them in us and for us. This line of argument is developed especially in Eclaircissment XVII. But if it is God who gives us all our ideas and corrects for the distortion of the retinal image, then it would seem misleading to talk of "means" used in making judgments, or indeed of the soul making any judgments at all.

In order to avoid confusion we will begin with the more psychologically oriented account of natural judgments in the Recherche. Rather than giving an exhaustive description of his theory, we will focus on his account of distance perception, and how it differs from that of Descartes, and provide a few examples to illustrate this.

First, the whole purpose of his discussion of the senses is different. Descartes' aim was to show that his own mechanistic system could adequately explain perception without recourse to those entities which the scholastic explanation had relied on, such as substantial forms and real qualities.

Malebranche, by contrast, is motivated by a desire to completely discredit the senses as guides to truth, and thus focusses on "errors of sight with regard to extension in itself",[66] "errors of the eyes regarding shapes",[67] "errors of our eyes regarding the movement or rest of bodies,"[68] etc. His discussion of distance perception aims to show how few and approximate are the means by which we judge distance. For since distance perception is involved in our perception of size, shape and motion, our inability to accurately judge distance will introduce errors into our perception of these other things also.

Secondly, we do not find in Malebranche an emphasis upon the spatiality of our own body, and the importance of this for visual spatial perception as we did in Descartes.

66/ R-L, Vol. I, p. 79.

67/ Op. cit. p. 94.

68/ Op. cit. p. 105.

Descartes' account of situation perception, as we have seen, relied heavily upon our knowledge of where the parts of our body are and our ability to transfer our attention out from them in straight lines. His natural geometry theory also relied upon these abilities. Significantly Malebranche does not discuss situation perception at all, and his discussion of the way in which the angle made by the optic axes helps us judge distance is subtly different from Descartes' natural geometry theory. Although he gives the same example of the blind man with the sticks, and talks about the angle made by the sticks (or the optic axes) at the object, he emphasizes that changes in this angle must be "sensible" -- i.e. we must be aware of them -- before they can serve as means for perceiving distance.

> The disposition of the eyes which accompanies the angle formed by the visual rays ... is thus one of the best and most reliable means which the soul uses to judge the distance of things.... If, therefore, the angle does not change sensibly [sensiblement]... the soul cannot make use of this means to judge the distance of the object. [R-L, Vol. I, p. 110-111]

The difference is subtle, but still, I think, important. When reading Descartes one has the impression that the "natural geometry" which we employ in visual spatial perception is an extension of the kind of natural knowledge which we, as embodied beings, have of the location of the

parts of our own bodies. And in reading Malebranche one has more the impression that a disembodied soul is being guided in its judgments solely by the presence or absence of a perceptible feeling of change in the disposition of the eyes, which it takes as a sign of distance.

A third difference between Descartes and Malebranche is that while Descartes was ambivalent about whether to explain perception wholly on the basis of anatomical structures and mechanically specifiable changes in the body (mechanical model) or whether to have recourse to a little inner judge (homunculus model) Malebranche relies wholly on the homunculus model. Descartes could suppose that changes in eye shape caused changes in our brain which cause us to perceive distance simply because of the way God joined our soul to our body. Malebranche recognizes that the shape of the eye must change in order to bring light from objects at various distances to a focus on the retina, but takes the feeling of straining our eye muscles which accompanies changes in eye shape to be the means by which we judge distance, rather than the changes in eye shape themselves. If an object is a half a foot from us, we can feel the strain in our eye muscles; if it is at two feet we feel it slightly, but if we go much beyond a few feet:

> ... the disposition of our eye muscles becomes so little sensible that it is useless to us for judging the distance. [R-L, Vol. I. p. 113]

Although the difference between their theories on this point may seem small it has important implications. Malebranche's reasoning here, if generalized, would imply that only things we are aware of can serve as means by which we perceive distance, since the soul, after all, can only make judgments on the basis of data actually given to it. If I am not aware of the shape of my eye or (to use a more modern example) of the disparity between my two retinal images, then these cannot serve as means by which I perceive distance. Malebranche's methodology, thus, would rule out much modern perceptual psychology. And what is perhaps worse, it leads to a rather alarming over-intellectualization of perception. The number and complexity of the judgments which the soul would have to be making constantly is so staggering that, in the end, he has to conclude that it is God who makes these natural judgments in us and for us:

> ...just as we could form them [the judgments] ourselves, if we knew optics and geometry as God does, all that actually takes place in our eyes and our brain, and if our soul could act upon itself to give itself sensations. [R-L, Vol. I, p. 120]

It is thus rather misleading to call them judgments. We experience them as sensations; he calls them "compound or composite sensations".[69/]

69/ R-L Vol. I, p. 100.

> However that which is nothing else but sensation in us may be considered in respect of the Author of Nature who excites it in us, as a kind of judgment. [R-L, Vol. I, p. 97]

The necessity of God's involvement is argued for especially cogently in Eclaircissment XVII where he considers the example of our seeng a white horse galloping to the right, and discusses at great length all the knowledge we would need and the calculations we would have to make in an instant in order to give ourselves even a simple perception like this. I would have to know that light rays travel in straight lines (and thus the horse is somewhere in a straight line out from me), that the light rays cross in my eye so that the horse is moving to the right, and is on his feet, although his image has the opposite situation, that it is 100 feet off because of my knowledge of the size of intervening objects (and "other means which it is not necessary to explain here)",[70] that "as the diameter of my eye is to its image, so the distance of the horse is to its size" (and thus I know it is a large horse), that it is running fast because of various complex calculations, that it is white because I know "what sort of shaking the rays produce on my retina ... I always give myself infallibly such a sensation whenever there is this sort of shaking on

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70/ R-L, Vol. III, p. 344.

my retina",[71] and lastly, if I too am in motion, further very complex calculations are required of me to figure out how much motion is due to my own motion and how much to the horse's motion.

Since the above calculations would obviously be impossible to any finite intelligence, it follows that only God could give us the perceptions which we have of objects. Indeed, this whole passage could be read as a kind of reductio ad absurdem of Descartes' natural geometry theory. Instead of the soul making the judgments, then, Malebranche believes that God acts on the occasion of the motions transmitted to our brains, and always acts in regular ways. This presumably serves as an explication of certain errors of sight, for if something malfunctions in the system we may see things wrong, although God is following rules which generally provide correct reflections of reality.

Summary

In terms of our interest in the emergence of perceptual idealism, the main thing which stands out about Malebranche's account of distance perception, is the involvement of judgment in all the means by which we perceive distance. This is a significant modification of

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71/ Op. cit. p. 344-5.

the Cartesian theory which had relied upon our perception of the spatiality of our body and upon physiological changes (e.g. eye shape) of which we need not be aware, as well as upon acts of judgment or reasoning by the mind. Malebranche supposes the mind to make judgments on the basis only of things we are aware of, thus severing any real connection with the body. This prepares the way for Berkeley's argument that if the mind does not perceive some idea immediately, then it must perceive it by means of some other idea it perceives immediately.

In spite of the ubiquitousness of judgment in perception on Malebranche's view, however, he, like Descartes, does not come out and say that distance is not seen, or is invisible.[72/] And the reason he does not, I would suggest, is because of God's role in the perceptual process. Our perception of distance, the result of a "natural judgment", is really a compound sensation in us (or at least experienced as a sensation), even though it is also a judgment when viewed from God's point of view. Since it is not really us who make the judgment, then distance is really just given to us, and it is thus natural to speak of it as seen.

72/ It is interesting that he does not do so, for the diagram he uses to illustrate how we are subject to errors of motion could well have served as an illustration for Berkeley's argument in section 2.

Locke

Unlike Descartes, Malebranche and Berkeley, Locke did not write a book on vision and did not provide any sort of comprehensive theory of distance perception. He does, however, say things which imply that the third dimension is not seen, but rather added by the judgment on the basis of experience. Since his work was very influential upon Berkeley, we shall pause and examine those passages which are relevant to distance perception, and to the distinction between seeing and judging. The key one for our purposes is his discussion of our visual perception of the convexity of a sphere, found in the Essay, book II, IX, 8.

> We are further to consider concerning perception, that the ideas we receive by sensation are often in grown people, altered by the judgment, without our taking notice of it. When we set before our eyes a round globe of any uniform colour, v.g. gold, alabaster, or jet, it is certain that the idea thereby imprinted on our mind is of a flat circle, variously shadowed, with several degrees of light and brightness coming to our eyes. But we have, by use, been accustomed to perceive what kind of appearance convex bodies are wont to make in us; what alterations are made in the reflections of light by the difference of the sensible figures of bodies; -- the judgment presently, by an habitual custom, alters the appearances into their causes. So that from that which is truly variety of shadow or colour, collecting the figure, it makes it pass for a mark of figure, and frames to itself the perception of a convex figure and an uniform colour; when the idea we receive from thence is only a plane variously coloured, ...

He is thus quite explicit that when we look at a sphere the idea "imprinted on our mind" is of a flat circle or a plane variously colored. Since these ideas are received through our sense of sight, they would be classified as ideas of sight. More specifically, these ideas of two-dimensional shapes are called by Locke our "true" or "original" ideas of sight, as is shown by the following passage from his critique of Malebranche (which can, I think, be plausibly interpreted to refer to his discussion of the sphere in the Essay):

> In the next place where he says, that when we look on a cube "we see all its sides equal". This, I think, is a mistake; and I have in another place shown, how the idea we have from a regular solid, is not the true idea of that solid, but such an one as by custom (as the name of it does) serves to excite our judgment to form such an one. (Locke, Works, Vol. IX, p. 218)

This passage highlights an important difference between Locke's theory and that of Malebranche, who was willing to say that we see all the sides as equal even though there is a "natural judgment" involved. To say that we see the sides as equal is equivalent to saying that we see it as a three-dimensional figure, since it is only when we see it as three-dimensional that we see the sides as equal (as psychologists have shown). Locke, by contrast, restricts his use of the term "see" to the "true" or original idea of the two-dimensional figure, and regards our idea of the

three-dimensional, equal-sided cube as a product of our faculty of judgment.

Although Locke uses the term "judgment", however, it is important to realize that the process by which the mind gets from the idea of the flat circle to the idea of the sphere is quite unlike the processes hypothesized by Malebranche or Descartes when they spoke of judgments. He does not admit the existence of any sort of innate principles, which would rule out the sort of implicitly mathematical judgments involved in the natural geometry theory. And he does not accord God any active role in perception (beyond creating us), which rules out the sort of "natural judgments" by means of which Malebranche supposed that the defects of the retinal image were corrected for. According to Locke, the mind really is presented with ideas of sight which represent all objects as two-dimensional shapes, and it is only habits built up through experience which enable our faculty of judgment to correctly form ideas of the three-dimensional objects which cause them. It "alters the appearances into their causes".

> This, in many cases, by a settled habit ... is performed so constantly and so quick, that we take that for the perception of our sensation which is an idea formed by our judgment; so that the one, viz. that of sensation, serves only to excite the other, and is scarce taken notice of itself; -- as a man who reads or hears with attention and understanding takes little notice of the characters or sounds, but of the ideas that

> are excited in him by them. [Essay Concerning Human Understanding, II, IX, 9]

The learning involved in our being able to perceive three-dimensional shapes by sight, then, takes place through the mechanisms of habit and the association of ideas, much as it does on Berkeley's theory. Unlike Berkeley, however, Locke does not go into the relative roles of vision and touch in the learning process.

Summary

Although Locke did not specifically discuss our perception of how far away objects are from us (what Berkeley calls "distance" perception), his view that our "true" ideas of sight are two-dimensional would imply that they do not represent to us the distance of the object any more than they represent its real three-dimensional shape. Thus distance, too, would be not seen, but added by our judgment.

This claim that distance is not seen, but is rather the result of a judgment by the mind, forms an important starting point for Berkeley's argument for visual idealism in the NTV.

Molyneux

Brief mention must be made of Molyneux's work on visual distance perception, since his ideas about perception influenced both Locke and Berkeley. He carried

on a voluminous correspondence with Locke,[73] and his Treatise of Dioptrics or Dioptrica Nova had an especially deep impact upon the form which Berkeley's NTV took. It is basically Molyneux's theory which Berkeley takes to be currently "received for true"[74] and against which he directs his criticisms in sections 9-41.

Like Locke, Molyneux takes our perception of distance, "especially when so far removed, that the interval between our two eyes, bears no sensible proportion thereto; or when looked upon with one eye only" to be "rather the act of our judgment, than of sense; and acquired by exercise and a faculty of comparing, rather than natural."[75] But whereas Locke had merely stated that when we look at a sphere, the idea imprinted on our mind is of a flat circle, Molyneux offers an argument for this. He says:

> ... distance of it self, is not to be perceived; for 'tis a line (or a length) presented to our eye with its end towards us, which must therefore be only a point, and that is invisible. [Treatise of Dioptrics, p. 113]

73/ See, Pastore, Selective Theories of Visual Perception, pp. 66-70 and Dictionary of National Biography, Vol. XIII, pp. 585-6.

74/ See Section 8 of the NTV.

75/ Molyneux, Treatise of Dioptrics, or Dioptrica Nova, p. 113.

In his attempt to explain how we perceive how far away things are, Molyneux treats our perception of remote objects differently from our perception of near objects. The distance of far off objects is, he believes, estimated by means of the interjacent bodies, the comparative sizes of the objects or the faintness of their colors. Our ability to make these kinds of estimates would be learned from experience.

Molyneux's explanation of how we perceive the distance of nearby objects, however, harks back to the natural geometry theory. For binocular vision he cites "the turn of the eyes or the angle of the optic axes",[76] and for monocular perception he says that we:

> ... consider the pupil of one eye as having breadth, and receiving a parcel of rays from each radiating point. And according to the various inclinations of the rays from one point, on the various parts of the pupil, we make our estimate of the distance of the object. [Treatise of Dioptrics, p. 114.]

Several things must be noted about Molyneux's version of the natural geometry theory:

First of all his account of monocular distance perception is not found in either Descartes or Malebranche. Descartes is clear that if we are trying to determine the distance of an object with only one eye, we must move and

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76/ Ibid.

look at the object from two different observation points if we are to utilize natural geometry, and Malebranche nowhere mentions our calculating the angles of incidence of rays falling on the eye from the same point of the object. The Barrovian problem, considered by Molyneux and Berkeley both, is thus a problem for Molyneux's theory but not for those of Descartes or Malebranche.

Secondly, Molyneux does seem to be relying upon what we have called the homunculus model. His Treatise of Dioptrics abounds with references to the soul or visive faculty making various calculations, directing its attention along light rays, comparing, estimating and judging. Since the calculations he postulates are based upon information of which we are never aware, his theory is open to the same objections Descartes faced in postulating unconscious reasoning processes. Since he relies exclusively on the homunculus model, this makes his theory particularly vulnerable to Berkeley's objection that I cannot be making calculations based on angles of light rays if I am not aware of doing so.

Summary

Molyneux's theory of distance perception was an important influence upon Berkeley in that it confirmed Locke's view that our visual perception of distance (especially far distance) is an act of judgment rather than of sense, and

provided an argument to support this. It was also important because it was his geometrical theory which Berkeley used as a springboard for establishing his idealism of vision, as we shall see below.

PART IV

BERKELEY'S NEW THEORY OF VISION

All the philosophers we have discussed in this chapter have been men who, like Descartes, were very much enamored of the new mechanistic science, and who wished to accomodate their philosophy to that science. They all tried, in varying degrees, to also defend the Christian faith, and did not perceive there to be any fundamental incompatibility between the two. Berkeley, by contrast, saw the new mechanistic philosophy as the enemy of religion, and intended to replace it with his own "immaterialist" philosophy.

His early work, the NTV, served as a kind of spearhead for immaterialism in that it focussed only upon establishing the ideality of what we see, while allowing that what we touch is the real physical object.[77/] Thus although

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77/ There is considerable evidence that Berkeley was already an immaterialist at the time he wrote the NTV. See Luce's notes to the Philosphical Commentaries, in Volume I of the Works of George Berkeley, and his treatment of these same works in The Dialectic of Immaterialism, especially pp. 88-102. Stack simply assumes at the start that "the ostensible 'realism' in regard to tactile sense impressions is merely a concession which Berkeley made to philosphical views held at that time of the writing of the Essay Towards a New Theory of Vision, and can in no way be thought to be his considered opinion." Stack, Berkeley's Analysis of Perception, p. 10. Harry Bracken also says that, in the face of Luce's work on the Commonplace Books, it is "no longer credible" to suppose that Berkeley really
(Continued next page)

the ostensible purpose of the NTV was to provide an explanation of how we visually perceive distance, magnitude and situation by sight, the more important underlying purpose was to remove an anticipated objection to his immaterialism by weaning its readers away from their belief that they see physical objects out from them in space, and thus to further his goal of establishing a more general idealism, as he admits in the Principles.

> ... that we should in truth see external space, and bodies actually existing in it, some nearer, others farther off, seems to carry with it some opposition to what hath been said of their existing nowhere without the mind. The consideration of this difficulty it was that gave birth to my Essay Towards a New Theory of Vision ... [Principles, §43]

In addition to being a kind of metaphysical half-way house which insists only upon an immaterialism with regard to the objects of vision, the NTV was unique among Berkeley's works in that it integrated scientific and philosophical considerations, thus bringing in the prestige of science to support an immaterialism of vision. For this reason it was better received and more widely read read than his more purely philosophical works such as the Dialogues and Principles.

77/ (cont.) held that the objects of touch exist outside the mind at the time he wrote the NTV. Bracken, Berkeley, p. 19. Thus, we may assume that it is for purely strategic reasons that he does not argue for the ideality of what we touch in that work.

Although it does not establish the ideality of the objects of touch, the NTV does present for the first time a full-blown idealism of vision, characterized by the following four claims. (1) there is a distinction between what we see immediately or directly and what we perceive by means of this, (2) what we immediately see exhausts what we have access to through sight, strictly speaking, (3) physical objects are never immediately seen, and (4) what is immediately seen is mental in nature, having no existence outside our own mind. Certain of these had already appeared in the work of previous philosophers. For example, Malebranche had held that we never directly perceive physical objects, but believed that we have access to them through God's ideas. Berkeley is the first to explicitly hold all four claims simultaneously.

The NTV is a rather difficult and obscure work designed to draw the reader gradually into an increasingly radical idealism. Certain things are, thus, assumed in the first sections (such as the immediate perception by sight of visible size and shape) which are repudiated in the later sections.[78] Fortunately for our purposes,

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78/ In section 43 he speaks of visible extension, figure and motion as perceived by sight. Again in §49 he refers to visible figure and extension. In the magnitude section he speaks of visible extension, this time measured by the number of points or minima it (Continued next page)

however, Berkeley believes himself to have established all of the four claims taken above to be constitutive of visual idealism in the first 51 sections -- those which deal with distance perception. Thus we will be able to narrow our focus predominantly to these sections and avoid becoming entangled in some of the perplexing issues which arise in comparing the later sections with the earlier ones. An exhaustive analysis of even the argumentation of the first 51 sections would lead us into issues which are only tangential to our purposes. Our more limited goal here will be to show that his argument does, in fact, bring in

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78/ (cont.) includes. Although he continues to refer to visible figure and extension, however, there are a growing number of indications that he does not believe our visual perception of figure or number or be immediate. In section 110 he says that a newly sighted man would not group his new visible ideas into collections corresponding to "head" or "feet". Hence it would follow that our perception of figure by sight is not original.

Our ability to perceive figure and number by sight would thus be wholly the result of experienced correlations with touch. In particular, he suggests, our eye movements as we survey an object with our eyes become mixed with the ideas of sight, making us think the perception of figure by sight is immediate (§145). In the last analysis, he believes that all we immediately perceive by sight is a fleeting and changeable array of light and colors, and that any spatial properties we perceive, two-dimensional as well as three-dimensional are wholly the result of correlations with touch. (see §§156-158) Thus an angel, if supposed to see perfectly well, i.e. to have a clear perception of the proper objects of sight, but to have no sense of touch, could not perceive even two-dimensional shapes.

and rely upon all three strands of thought which we have been tracing in this chapter, and that the effectiveness of his argument derives largely from this ingenious interweaving of previously separate issues.

Distance: Seeing and Judging

The material which was discussed in Part III above has a very obvious relevance to the argument of the first 51 sections of the NTV since it is in these sections that Berkeley provides his own answer to the question of how we perceive distance by sight. The well-known argument of Section 2 in particular can be seen to rely upon the way in which the distinction between seeing and judging had evolved through the work of Descartes, Malebranche and Locke to a point where the third dimension was regarded as the result of judgment and not something yielded by our sense of sight.

Argument of Section 2

In Section 2, Berkeley writes:

> It is, I think, agreed by all that distance, of itself and immediately, cannot be seen. For distance, being a line directed end-wise to the eye, it projects only one point in the fund of the eye, which point remains invariably the same whether the distance be longer or shorter. [§2]

This argument has puzzled many commentators since it is not clear just why the fact he cites about the retinal image proves that we do not immediately see distance unless

it were supposed that we immediately see our retinal images, something which is obviously false.[79/] Since most modern philosophers of perception tend to base claims about visual sense data on introspection rather than on any scientific information about vision, this apparent reliance by Berkeley upon facts about the retinal image seems particularly odd.

Our study of the optical tradition which had its source in Descartes' Dioptrics has put us in a position to understand why this argument would have seemed compelling to Berkeley and his contemporaries. As we saw in Part III above, the reason why our perception of distance, situation, size and shape was regarded as particularly problematic was because they were felt to be insufficiently explained by Descartes' anatomically based account of how vision occurs. If the two retinal images (considered as patterns of motions) are transmitted to the pineal gland, where they are merged and act upon the soul, this mechanism adequately explains how we see a two-dimensionally arranged pattern of colors, but not how we see the distance, situation, or the correct size and shape of the objects.

Although Descartes himself did not do so, his successors had come increasingly to draw the distinction

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79/ See, e.g., David Armstrong, Berkeley's Theory of Vision, p. 9.

between seeing and judging in such a way that they took what we see to be structurally isomorphic with the retinal image. That was what they believed our sense of sight yields us, and all else was supposed to be added by the mind or judgment. Thus we found Locke speaking of the true or original ideas of sight as two-dimensional.

Whether or not Berkeley himself accepts the Cartesian theory of the mechanics of vision, he allows the reader to go on assuming it to be true, and this gives force to the argument of Section 2. In the last analysis, of course, Berkeley believes that only God causes our ideas, and that all other supposed causes such as light, nerves, retinae, etc. have no existence except as ideas in minds, and would thus have no causal efficacy. But if Berkeley were to state this at the start of the NTV, then the argument of Section 2 would lose its force. It relies upon the assumption that there is a causal connection between the retinal image and what we immediately see of such a nature that we would expect what we immediately see to be structurally isomorphic with it.[80] And Descartes' theory of vision postulated just such a causal connection.

80/ The hypothesis that Berkeley takes what we immediately see to be structurally isomorphic with the retinal image and that this is implicitly justified by appeal to the Cartesian theory of vision is confirmed by several things he says in the magnitude section. In Section 70 he claims that the "visible magnitude" (Continued next page)

The argument of Section 2, thus, develops out of and relies upon the same basic Cartesian assumptions about vision as Malebranche's and Locke's work did. Berkeley takes it to have established that "distance of itself, and immediately, cannot be seen." Thus the fact that we apparently perceive it by sight all the same becomes problematical, and the purpose of the rest of the distance section is to show by what "means" it is perceived, and why it seems to us so very much as though we do really see it.

Section 2 has done nothing, however, to establish that vision gives us no access to physical objects, or that what we see is mental in nature. In fact, Berkeley does not begin to explicitly argue for these claims until section 41. The intervening sections are taken up with Berkeley's criticisms of the geometrical theory of distance perception and his presentation of and defense of his own theory. In these sections he basically uses the problem of distance perception to prepare the ground for the kind of

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80/ of the moon is less at the horizon than at the zenith (§70). Here he can only be talking about the relative retinal sizes since introspection would lead us to suppose the reverse (hence the "moon illusion"). His claim that visible objects are made up of visible points or minima is similarly hard to justify on the basis of introspection (since objects appear continuous) but makes sense in light of Descartes' supposition that we can only perceive as many parts to an object as there are optic nerves in the part of the retina upon which its image is projected.

metaphysical conclusions he intends to reach. He does this in several ways. First of all he elucidates what is meant by "immediately" seeing or perceiving in such a way that it is implied that what is not immediately seen is not seen at all. Secondly, he insinuates a particular methodology for explaining our perceptual abilities according to which all the "means" we use to perceive distance must be things we are conscious of.

Berkeley's Elucidation of the Term "Immediate"

The argument of section 2 established that distance is not seen "immediately". It is not, however, obvious just what Berkeley means by the term "immediately". The term does not appear in the passage cited above from Molyneux's Treatise of Dioptrics upon which the argument of section 2 was modelled. In spite of its centrality to the NTV, Berkeley nowhere gives us either a definition of the term, an argument to the effect that there is a distinction between what we immediately see and what we see by means of this, or a set of criteria by which we can determine whether something is or is not immediately seen.

In section 9, however, he gives us an analogy meant to help us understand the distinction between immediate and mediated perception.

> ... the passions which are in the mind of another are of themselves to me invisible. I may nonetheless perceive them by sight, though not immediately, yet by means of the colours they produce in the countenance. We often see shame or fear in the looks of a man, by perceiving the changes of his countenance to red or pale.

What is immediately seen is the colors of the man's face. What is perceived mediately by sight is the shame or fear he is experiencing, and these, being by their nature invisible to me, are perceived only by means of the colors of his face. If I did not perceive the blush, I could not perceive the shame. And, distance, he tells us, is to be thought of as "in its own nature imperceptible" just as the passions in another's mind are, and therefore, like those passions it must be "brought into view by means of some other idea that is it self immediately perceived in the act of vision."[81]

If perceiving a man's shame or fear by the colors of his face is taken as a paradigm of the difference between immediate seeing (the colors) and mediated seeing (the emotion) then we are already set up to be receptive to

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81/ NTV, section 11.

Berkeley's explanation of distance perception.[82] Just as what we immediately see (colors) is in a wholly different category metaphysically from what we perceive by means of it (emotions), so also on Berkeley's view light and colors are a kind of object which is metaphysically distinct from what we perceive mediately by means of them (i.e. tangible, physical objects). Furthermore we are led to think of distance as "invisible" in the way an emotion is. The emotions perceived by means of the colors of the man's face are not really seen. So, we are led to suppose, whatever is not immediately perceived by sight is not really seen either.

Berkeley's Methodology for Psychological Explanations

It is also important to Berkeley's general plan to establish that all the "means" by which we perceive distance must be themselves ideas which we immediately perceive.

82/ The comparison of distance perception with perceiving emotions is of course merely an analogy and does not prove anything. It merely disposes the reader to think about the problem of distance perception in a particular way. The issue of the metaphysical distinction between the immediate objects of sight and those perceived only mediately is taken up in a more rigorous way after he has reached the metaphysical conclusions he seeks to establish about the objects of sight in sections 41 and 43 -- particularly in sections 44-51 and in the last part of the NTV where he deals with the relation between the objects of sight and touch.

If what is perceived only mediately by vision is invisible, or not really seen at all, the next question which arises logically is how, then, is it perceived? Berkeley starts with what he takes to be an "evident principle" that:

> When the mind perceives any idea, not immediately and of it self, it must be by the means of some other idea ... no idea which is not it self perceived can be the means of perceiving any other idea. [§9]

Applying this to distance perception, he says:

> ... distance is in its own nature imperceptible, and yet it is perceived by sight. It remains, therefore, that it be brought into view by means of some other idea that is it self immediately perceived in the act of vision. [§11]

When we look more closely at Berkeley's suggested methodology for explaining our perceptual abilities, however, the principle he relies upon as evident is hardly self-evident, and when applied to the problem of distance perception it results in a radical and not uncontroversial simplification of his predecessors' theories of distance perception.[83/] In order to see just what his theory implies, it is helpful to look at how he, himself, applies it to the problem of magnitude perception. He says:

83/ Norman Daniels, in his book on Reid and the geometry of visibles, has also noted the radical simplification which Berkeley introduced by his reliance this "evident principle", and the connection between the methodology dictated by this principle and his idealistic metaphysics.

> ... in order to discover by what means the magnitude of tangible objects is perceived by sight, I need only reflect on what passes in my own mind, and observe what those things be which introduce the ideas of greater or less into my thoughts. [§56]

Adherence to the principle that whatever is not immediately seen must be perceived by means of something which is, has, thus, the consequence of committing Berkeley to an introspective method in psychology. This, in turn, underlies his first criticism of the geometrical theory. If I am not aware of the angle made by my optic axes, then I cannot perceive distance by means of that angle. Such other factors as eye shape or (to use a more modern example) binocular retinal disparity, could not be means by which we perceive distance either, since we are not conscious of them.

By contrast with the geometrical theory, all the "means by which Berkeley suggests that we perceive distance are things we are immediately aware of: the feeling of turning the eyes to look at a near object, the confused appearance of a close object, and the feeling of straining the eyes to prevent blurring when an object comes very close. All of these are also things whose connection with the distance of objects would have to be learned; thus even

near distance perception is not natural but acquired, and is, for this reason, not an act of sense.[84/]

In suggesting that what is not seen immediately is not really seen at all (but is invisible), and in persuading the reader to accept a methodology for explaining our perceptual abilities which requires that all the "means" by which we perceive distance be ideas of which we are immediately aware, Berkeley has set the stage for the important conclusions he intends to develop in sections 41-51. Anything other than what we "immediately see" will have to be merely suggested by sight. However, until he establishes the ideality of what we immediately see, we do not yet have a fully idealistic understanding of vision. Implicitly we do, but it is the work of the final ten sections of the distance section to unfold and develop that idealism. This he does by relying upon the other two strands of thought we have discussed in this chapter, namely the theory of ideas and the subjectivization of light and color.

84/ Berkeley apparently shares with Locke and Molyneux the assumption that if something requires learning in order to perceive, then it does not count as something we sense, but rather as something added by our judgment. Thus, one criterion for "immediate" seeing is that it require no learning. Since the other criterion is that it be structurally isomorphic with the retinal image, this generates a certain ambivalence about whether figure or number are immediately seen. (See note 78 above.) They require learning to perceive, according to Berkeley, but are found in the retinal image.

The Theory of Ideas

The influence of the theory of ideas upon Berkeley's argument cannot, of course, be confined to any particular section or sections since it is an all-pervasive one. Nonetheless, it is extremely important for Berkeley's attempt to establish the ideality of the objects of sight. He speaks constantly of ideas perceived in the act of seeing,[85] of an idea being immediately perceived,[86] perceiving ideas of sight,[87] etc., and it is clear that in so speaking he is relying upon the philosophical currency which Locke had given to the term "idea". As he says in section 45:

> I take the word idea for any immediate object of sense or understanding, in which large signification it is commonly used by the moderns.

The point in the argument of the NTV where the theory of ideas comes most clearly into play is the argument of §41. Having, he believes, shown that all the means by which we perceive distance are things like confusion, faintness, or feelings of straining the eyes which must be learned by experience since they have no necessary

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85/ NTV, §16

86/ NTV, §9

87/ NTV, §45

connection with distance, he then draws the following conclusion:

> From what hath been premised, it is a manifest consequence that a man born blind, being made to see, would at first have no idea of distance by sight; the sun and stars, the remotest objects as well as the nearer, would all seem to be in his eye, or rather in his mind. The objects intromitted by sight would seem to him (as in truth they are) no other than a new set of thoughts or sensations, each whereof is as near to him as the perceptions of pain or pleasure, or the most inward passions of his soul. For our judging objects perceived by sight to be at any distance, or without the mind is intirely the effect of experience, which one in those circumstances could not have attained to. §41. (emphasis added)

Here, for the first time, we find a clear statement of Berkeley's position that the objects we see are "no other than a new set of thoughts or sensations...". Since this argument is of such pivotal importance, we shall examine it below in detail.

First of all it must be noted that phenomenal mind localization (i.e. the man taking the ojects to be located in his mind) does not follow from what has been premised. All that Berkeley claims to have established is that the means by which we perceive distance are: (1) the feeling of turning the eyes to view a nearby object, (2) the confused appearance of nearby objects, and (3) the feeling of straining the eyes to prevent blurring if an object is very close, and that these "means", unlike the angles of the

geometers, have only a contingent connection with distance. Presumably, then, a newly sighted man would at first be unable to tell how far away objects are, and would need experience to tell that, e.g., confusion is connected with, or a sign of near distance.

This does not, however, prove that he would see them as in his eye. Merely because there is no particular distance at which an object appears to be (say, 20 feet or 1/2 mile) it does not follow that it will appear to be at no distance. The newly sighted man might perceive all objects to be equidistant, as we perceive the stars in the sky to be equidistant because we cannot tell their real distance, or as external to him, but at an indeterminate distance, as would occur if one were shown a luminous dot in an otherwise darkened room. And if Berkeley's argument fails to prove that the newly sighted man would first see all things as in his eye, it certainly does not prove that he would perceive them as in his mind.

This, then, is where the theory that we immediately or directly perceive our own ideas comes in. The newly sighted man would, Berkeley thinks, perceive them as being in his mind because that is where they are. We immediately see our visible ideas, and ideas have no existence outside the mind of the perceiver. They are, to use Berkeley's phrase, not "without the mind".

This argument can, I suggest, be understood as Berkeley's attempt to unpack the metaphysical consequences of Locke's theory of ideas. Malebranche, as we saw, was convinced colors existed only as modifications of our souls, and therefore he had a problem with explaining why we perceive them as external at all, and had to develop a theory of color localization to explain it. However, since he held that our clear and distinct ideas were perceived in God, he did not have a problem with why we perceive the extension and shape of objects to be external to our minds, and his account of distance perception went along quite Cartesian lines. Locke, however, collapses the distinction between ideas and sensations and says that in all its operations the mind has no object other than its own ideas. Thus since ideas are as subjective as sensations were for Malebranche, being merely modifications of my mind, Berkeley thinks, it becomes problematic why objects are perceived as external at all.

Berkeley is thus able to conflate what had previously been separate questions: (1) distance perception -- the problem of how we tell how far away objects are -- a problem which had its roots in optics and in Descartes' physiology, and (2) externality perception -- the problem of why we perceive them as external to our minds -- a problem which had its roots more in the dichotomy between mind and

body and the theory of ideas. Thus in this §41 argument Berkeley can go from the fact that the newly sighted man cannot tell how far away objects are (i.e. he lacks distance perception) to the claim that he will have no perception of externality. Since distance perception must be learned, externality perception must be also.[38/]

Light and Color

At this point Berkeley brings in the subjectivity of light and color to further butress his claims about the ideality of what we immediately see. His only reference to it is in section 43, and is made in a rather offhand manner as though it merely provides confirmation of his own view independently of the arguments by which he himself arrived at it. He says:

> ... even those who from their birth have grown up in a continued habit of seeing are (not) irrevocably prejudiced on the other side, to wit in thinking what they see to be at a distance from them. For at this time it seems agreed on all hands, by those who have had any thoughts of that matter, that colours, which are the proper and immediate object of sight, are not without the mind.

The casualness of Berkeley's reference to the subjectivity of light and color should not, however, blind us to its importance for his argument. His statement here

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88/ Berkeley's position here is in contrast to that of Reid, who supposes our perception of objects as outside of us to be innate. Daniels, op. cit., p. 40.

that what we see is "not without the mind" constitutes a very clear and strong statement of visual idealism. His reference to light and color being the "proper and immediate objects of sight" is also significant. Let us look more deeply into why this passage is important to Berkeley's argument for the ideality of the objects of sight or what we "immediately see".

As we have seen above in Chapter I, one of the central doctrines of Aristotle's theory of perception was the distinction between proper and common sensibles. The proper objects of sight were light and color, and they were called proper objects of sight because they were perceivable only by sight. The common sensibles, such as size and shape, were also, Aristotle taught, perceived by sight, but with the cooperation of the common sense which served the function of integrating the several senses.

The changes made by Descartes, however, attacked the foundation of the distinction between proper and common sensibles by reducing the proper sensibles to the common sensibles, treating extension, figure and motion as the objects of all the senses alike. Inasmuch as we experience a different sensation when our ears are moved by certain particles than we do when our retinae are moved by other finer particles, this is merely because of the differences in the nerves stimulated, the part of the brain affected

and, ultimately the good pleasure of God who connected that sensation to that motion in our brain. It is not because of any qualitative difference in the stimuli or objects of the senses themselves. Since colors were no longer considered to be real and irreducible components of reality, they came increasingly to be regarded as existing only in the consciousness of the perceiver, as we have seen above in Part III.

In Section 43, then, Berkeley relies upon the Aristotelean doctrine that light and color are the proper objects of sight, insinuates that these are the same as what he calls the "immediate" objects of sight by conjoining the two terms, "the proper and immediate objects of sight", and then brings in the widely accepted view that light and colors have no real existence outside the perceiving mind to underline the mental nature of what we immediately see.

The fact, then, that the mechanistic science of Galileo and Newton, so popular at that time, held that only those aspects of reality thought to be basic to scientific explanations, such as extension, number, figure and motion, were really objectively out there in the world, created a climate receptive to an idealistic understanding of vision. People were thus open to this in a way they were not open to the more general immaterialism of Berkeley's

later works. Put informally, we might say that they were already open to believing that colors weren't really "out there" because they thought this was the opinion of the most up to date scientists. But these same scientists held that things like extension, figure and motion were "out there", so when Berkeley questioned these they regarded him as eccentric and ignored him.

In the passage immediately following the one quoted above, Berkeley goes on to address those who hold that although colors are not without the mind, extension, figure and motion are (basically the position of the mechanistic scientists). Against them he argues:

> I appeal to any man's experience, whether the visible extension of any object doth not appear as near to him as the colour of that object; nay whether they do not both seem to be in the very same place. Is not the extension we see colored, and is it possible for us, so much as in thought, to separate and abstract colour from extension? Now, where the extension is there surely is the figure and there the motion too. I speak of those which are perceived by sight. [§43]

This sort of argument, extending the subjectivity of light and colors to include also the extension, figure and motion which we see, is obviously addressed to the common man or to the philosophers, and not to the scientists. One can hardly imagine Galileo, for example, being swayed from his belief that we perceive the extension, figure and motion of physical objects by this sort of appeal to

introspection, because his distinction between primary and secondary qualities was based not on introspection, but on a scientific theory about the nature of the material world. Indeed, the appeal to introspection, if applied to colors, would cut equally against Berkeley's own position, since colors do appear to be external to us.

Vision and the Objects of Touch

Having established his key metaphysical claim that what we immediately see, or the "objects intromitted by sight" are merely a set of thoughts and sensations, having no existence without the mind, Berkeley spends the remainder of the distance section attempting to clarify their relation to those physical objects perceivable by touch still supposed to exist out from us in space. It is in these sections that he tries to establish that what we "immediately" see exhausts what we have access to through vision, strictly speaking. They are merely "suggested" by what we see, just as the meaning of a word is suggested to, or presented to our mind when we hear the sound of that word.

The way Berkeley goes about establishing these conclusions is characteristic of his philosophical writing style. He does not neatly set out the premises and conclusion of his argument. His approach is instead a psychological one aimed at persuading, making frequent use

of analogies. He senses that the reader, after the arguments of sections 41 and 43 will be beginning to feel a bit unsettled; his common sense conviction that he sees objects at a distance from him has been threatened by the assertion that the proper and immediate objects of sight have no existence outside his mind. Hence, Berkeley must anticipate and answer the reader's objections, and offer him an alternative model for explaining vision.

Given that the general philosophical climate at this time was largely shaped by Locke, the first escape route which the reader would try would be to concede that what we immediately see exists only in the mind, but to try to maintain that it is the resemblance of the objects out from us in space.

Accordingly, in section 44 he undertakes an analysis of what we mean when we say we see something at a distance or that what we see is the resemblance of something at a distance. Using the examples of the moon and of a distant tower, he points out that what we see is neither at a distance nor the resemblance of anything at a distance, since if we were to approach the moon or the tower we would not see anything like what we saw from a distance, since the appearance alters as we approach.[89] In section 45 he

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89/ This argument is, of course, of rather dubious worth. Berkeley has reinterpreted what his opponents take to
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offers his own explanation of what is meant when we say we see something at a distance. It is basically a verificationist account according to which the visible idea, due to my previous experience, determines me to think that if I advance so many paces or miles, I will be affected with such and such ideas of touch. But these tangible ideas are merely suggested by what I see, and have no necessary connection with it.

In sections 46 and 47 he draws out the consequences of this, trying to make them plausible by drawing an analogy between vision and hearing. He says:

> From what we have shown, it is a manifest consequence that the ideas of space, outness, and things placed at a distance are not, strictly speaking, the object of sight; they are not otherwise perceived by the eye than by the ear. [§46]

For example, he says, I hear the noise made by the coach, and from this I am able to perceive how far away it is. But the coach itself, considered as an external physical object, is not properly an object of hearing; and in the

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89/ be a relation between ideas and things, as a relation between some of our ideas and others of our ideas. But, surely, if physical objects are still conceded to exist, the question of whether our ideas resemble them is still a legitimate one (as it is not in the more developed idealism of Berkeley's later works). The question of the relation between objects of sight and touch is taken up again in sections 121-159, and his critique of abstract ideas plays an important role in the argument of these sections.

same way it is not strictly speaking the object of vision either.

Again, Berkeley anticipates the reader's objection that we do, after all, perceive the size and shape of objects by both sight and touch. This, he tells us in section 49 is false. We never see and feel one and the same object.

At this point, having reduced the reader to total confusion and perplexity, Berkeley attempts to reassure them again in the two remaining sections, providing his own explanation of how we perceive distance and why it seems to us so very much as though we see it. Here he begins to develop the language analogy, showing how it is that tangible objects become so linked with visual ones that we think we perceive them by sight. Just as meanings become so intertwined with the sound of words that they seem to enter the mind with them, so also tangible objects are linked by long association with visible ones. But just as we don't really hear the meanings, so we do not really see the tangible object.

SUMMARY

In the first 51 sections of the NTV, Berkeley has attempted to do something novel and extremely radical if looked at from the vantage point of previous philosophy of perception. He takes himself to have proved that our sense

of sight, strictly speaking, gives us no real access to anything existing outside our own minds. What we see has suggest to our minds certain experiences of touch which we would have if we moved our bodies in certain ways, and due to long habit the association between what we see and tangible objects becomes so strong that we think we really see them, but we do not. The objects we see form essentially a private light and color show which merely happens to be connected in regular ways with what we touch.

Since our sense of sight is of such central importance, Berkeley hopes that the acceptance of an idealistic interpretation of vision will function to break down people's resistance to a more general idealism. Just as Descartes attempted to provide a wholly mechanistic account of vision as a kind of showpiece to illustrate the explanatory power of his mechanistic philosophy, so Berkeley selects vision to demonstrate the power of his language model. If, he believes, we keep sharply separated what we immediately see and what is merely suggested by what we immediately see, the former functioning as signs of the latter, as words stand for meanings, then we are able to solve problems like the moon illusion and the Barrovian problem which proved insoluble on other theories.

The theory of vision, thus, became a battleground of sorts for competing philosophical systems. Berkeley wished

to use it to attack and destroy the new mechanistic philosophy which he so abhorred, and to insinuate his own idealistic phenomenalism by means of the analogy of vision with a language, an analogy later generalized to include all our sense experience.[90] At the time Berkeley wrote the NTV, the theory of vision provided a particularly fertile ground for the cultivation of idealism, for reasons involving both the current state of scientific knowledge about vision and also the philosophical framework Descartes had set up for the explanation of vision. The three strands of thought we have traced in this chapter all evolved out of this confluence of philosophical and scientific factors.

Looking first at colors, the way in which Descartes, in the interests of his mechanistic physics, denied the existence of the Aristotelean real qualities such as colors, had led philosophers into an increasingly subjective view of colors. This was reinforced on a popular level by a great enthusiasm for the new mechanistic

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90/ Colin Turbayne has noted the fact that Berkeley is using vision to persuade the reader of the usefullness of understanding all nature as analogous to a language, by contrast with the alternative model of seeing all nature as a machine, as Descartes had done. He correctly stresses the radical nature of this change and its far-reaching consequences. I would agree with much of what Mr. Turbayne says, except that I would emphasize more the metaphysical dimension, instead of merely the methological one. See, Turbayne's introduction to Berkeley's Works of Vision, and his more extended treatment of the subject in The Myth of Metaphor.

physics of Galileo and Newton. If scientists did not think that colors were out there in the world, this provided a strong confirmation of Berkeley's idealism about the proper objects of vision.

Again, on a philosophical level, the way in which ideas had come to be seen as inner objects of perception, particularly in the work of Locke, had implicit idealistic tendencies. For if all we perceive immediately is ideas, and if these are mental in nature, how can we know physical objects exist? And vision is the sense which it is easiest to understand in terms of the theory of ideas, because the retinal image serves as a convenient model of a visible idea, or an idea of sight. An idea is thus like a picture or image. It is a great deal harder, for example, to conceive of perceiving an idea of smell, taste, or even touch. Given the popularity of optics in Berkeley's time, people were generally acquainted with the existence and properties of the retinal image,[91] and it was easy for the unsophisticated to lapse into thinking that we see our

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91/ Thus Berkeley in section 88 says "There is at this day, no one ignorant that the pictures of external objects are painted on the retina or fund of the eye; that we can see nothing which is not so painted; and that according as the picture is more distinct or confused, so also is the perception we have of the object."

retinal images.[92] If we see our retinal images, what we see is already somehow subjective, being in us (on our retina), and thus the slide of the section 41 argument from the blind man seeing things as in his eye to seeing them as in his mind is a short and natural one.

Lastly, the problem of egocentric spatial perception (distance) was particularly suited to Berkeley's purposes in a way that magnitude perception, for example, was not. Psychologically it is much more closely bound up with the separateness of physical objects. If one thinks of the mind as "in here" and objects as "out there" (as Descartes tended to), then our inability to perceive distance could easily be viewed as an inability to somehow get "out there". Hence we are locked into our own mind.

Locke and Molyneux had already concluded that our perception of the third dimension is not an act of sense, but rather something which involves a judgment by the mind. Berkeley can, thus, start from the assumption that we do not see distance. His task, then, is merely to lead the

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92/ Even Molyneux tends to lapse into this view. He describes how the rays of light are focussed on the retina and then says that they there "paint[ing] distinctly the vivid representation of the object; which representation is there perceived by the sensitive soul (whatever it may be) the manner of whose actions and passions, He only knows who created and preserves it, whose ways past finding out, and by us unsearchable." [Treatise of Dioptrics, pp. 104-105.]

reader to interpret this in an idealistic way rather than a way more consistent with realism.

The claim that the eye cannot discriminate distance can be interpreted to mean that either: (1) we are unable to determine with a single eye fixation where along a line perpendicular to the eye a point lies, or (2) two different three-dimensional objects conveying identical arrays of light to the eye at a given point, cannot be distinguished with one eye fixation (as for example in the famous "Distorted Room" experiment conducted by Albert Ames).[93] Both of these interpretations of what it means to say we cannot see distance are compatible with realism, and do not establish that what we see exists only in our mind.

The interpretation Berkeley wishes us to place on the claim that we do not see distance, is that vision does not enable us to get outside our own minds, to perceive anything out from us in space. "Outness" is not perceived by sight. And the theory of ideas is necessary here. Not only can I not tell how far away things are, but there is something two-dimensional and mental which I immediately

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93/ This is a famous experiment in which a spatially very distorted room was constructed which from one viewpoint projects the same image on the retina as a normal rectangular room. When looking at it with one eye from that viewpoint subjects could not distinguish it from a normal rectangular room. See, Gregory, Eye and Brain, p. 177-180.

see -- namely my "ideas of sight". And since the proper objects of sight, light and color, were supposed to have no existence as light and colors outside our minds, this also provides a reason for supposing that what we see is mental and not a physical object out from us in space. Thus the reader is led to the idealistic interpretation of the claim that we do not see distance, rather than one of those consistent with realism.

It was Berkeley's own peculiar genius, then, which enabled him to weave together these three strands of thought discussed in Parts I through III above into the ingenious argument for visual idealism we have been discussing in Part IV, integrating philosophical and scientific considerations into a truly novel argument for the ideality of what we see.

CONCLUSION

We have now completed our investigation of the roots from which the perceptual idealism we find in Berkeley's Essay Towards a New Theory of Vision developed. In essence what we have attempted to show in this essay is that certain of the premises Berkeley relies upon in arguing for perceptual idealism in the NTV are ones which developed out of the changes Descartes made in the Aristotelean theory of perception. Specifically, these premises are: (1) ideas are the immediate objects of perception, (2) colors have no existence outside the mind of the perceiver, and (3) distance is not seen, but is rather the result of judgment. In this concluding section we shall briefly summarize the reasons why the Aristotelean framework for explaining perception did not give support to any of the three claims just enumerated, and why the Cartesian one did. For a detailed discussion and supporting argumentation, the reader is referred to the main body of the text.

First, let us look at why the Aristotelean framework did not give rise to the belief that we immediately perceive ideas. The reasons for this are very deep, involving some of his most important metaphysical assumptions, namely the belief that the soul is the act or form of the body as a whole, and the distinctions between act and potency, and

matter and form. But even before the metaphysical distinctions, we must keep in mind that all Aristotle's thought about perception occurs within a framework including both perceiver and world; that we perceive objects is assumed, and it is only a matter of reflecting on what must be postulated to explain how we do so.

The fact that Aristotle understands the soul to be the act or form of the body as a whole prevents any sort of inner dichotomy from developing between soul and body. The soul does not confront the body as an object.

The matter/form distinction is of great importance also. In knowing a tree, for example, the soul becomes the tree on an intentional level; it is informed by the same form which informs the tree. The form, thus, forms a bridge between object and perceiver uniting them, and thereby making knowledge possible without recourse to any representative entity between the two.

The distinction between potency and actuality also served to unite the perceiver with what is perceived. The sense is in potency relative to its object, and can only be brought to actuality by the action of the object. When sensation occurs, the sense is brought into actuality, the act of the sense and the act of the object being asserted to be one and the same. Thus no inner subject/object dichotomy is generated.

Descartes' metaphysical assumptions, however, are deeply different and lead us in a different direction.

First of all, he regards the soul and body as distinct substances, and believes they interact primarily at the pineal gland. Thus the soul confronts the body as an object external to it, although the fact that God has joined the two together mitigates this to some extent. And the localization of the soul at the pineal gland of necessity makes perception of the world indirect, since the soul is in contact only with the changes caused by objects in the cerebral cavities or pineal gland.

Second, his abolition of the Aristotelean forms and his replacement of them with figure left him without the kind of bridge between knower and known which forms had provided. It also tended to lock him into a theory postulating a little inner copy of the retinal image, in spite of his attempts to avoid a copy theory of perception.

And in place of the Aristotelean act/potency distinction according to which the act of the object in the perceiver and the act of the sense faculty are one and the same, we have a wholly mechanical view of the body as merely passive, as an inanimate object would be. The mind is confined to the brain where it is passively acted upon by the motions conveyed to the brain by the senses.

Basically, the changes Descartes has made amount to an attempt to provide a mechanistic account of how the figure

of the object seen is conveyed to the soul at the pineal gland. Thus although he does not come out and say our perception of physical objects is indirect, or mediated by ideas, it is clearly indirect in that the soul is acted upon only by the pineal gland pattern. Thus brain patterns are the immediate objects of perception, although we perceive them as the sensations God has joined to these motions.

Through the work of Malebranche, who severed the causal connection of mind and body, the inner objects of perception came to be seen as mental in nature, and, greatly helped by the way in which the retinal image provides a model for an idea, Locke carried on Malebranche's way of speaking of ideas as the objects of perception.

Turning next to the subjectivization of colors, we note that Aristotle insists uncompromisingly on the reality of the qualitative aspects of nature. His physics makes extensive use of the principle of contrariety in explaining change -- hot/cold, moist/dry, etc., and it is the qualitative aspects of the world rather than the quantitative which display contrariety. His account of perception is built upon the distinction between the proper and common sensibles, and it is essential to his theory that both the proper and the common sensibles truly characterize the objects we perceive. Thus objects are colored just as much as they are extended or have shapes.

Indeed, one of the grounds on which Aristotle was so hostile towards the atomists like Democritus was because they attempted to reduce the proper sensibles, like savors or colors, to the common ones like shape and motion. It was, he thought, essential for defending against scepticism, that we do not reduce the proper sensibles to the common.

Needless to say, Aristotle's framework for explaining perception, thus, did not lead toward the sort of subjectivization of colors upon which Berkeley's argument relies.

The case is totally different with Descartes. His committment to mechanism, both as a methodology and as a metaphysical position, obliged him to reduce the proper sensibles to the common ones, as the atomists had done. What colors we see were supposed by him to be a function of the ratio between the spin and the forward motion of the tiny particles which strike our retinae. The objects of all the senses alike were extension, figure and motion, different senses merely being sensitive to particles of different sizes.

Thus although he is somewhat ambivalent whether to identify colors with the configuration of particles at the surfaces of objects, with the rotation of the light particles, or simply with our sensation, he clearly does not hold them to be in the object as Aristotle had. It

remained for Malebranche to fully draw out the idealism latent in Descartes' theory of colors.

Finally the Aristotelean theory of perception did not lead to a sharp separation of seeing and judging, whereas the Cartesian one did.

What prevented Aristotle from separating seeing and judging in the way the post-Cartesians did, was his understanding of the role of the common sense. The common sense, as discussed in Chapter I, Part III, served as a sort of bridge between the mind and the senses. It integrates the special senses, accounts for at least a certain level of self-consciousness and checks the reports of the various senses against each other, correcting one by the other.

The common sense also enables him to explain how we perceive the common sensibles, explaining it as a function of our sense faculty rather than as something the mind does. The special senses, like vision, do not operate in isolation from the common sense; the central or controlling sense faculty perceives the common sensibles <u>through</u> the special senses.

Although Aristotle's discussion focusses on common sensibles such as size, shape or motion, it seems clear that distance perception would also fall under the province of the common sense. It could thus be perceived by our sense of sight operating in conjunction with our sense of

touch -- the work of the two senses being integrated by the common sense.

Descartes does not deny the perception by sight of the common sensibles, including distance, or separate seeing and judging as sharply as Locke and Berkeley were to do. All the same, his materialization and mechanization of the operation of our senses, and the virtual disappearance of any really functional common sense (although he preserves the label) prepare the way for the development of the seeing/judging distinction as it developed in his successors' work on vision.

The central mechanism of vision was, he postulated, the point for point projection of the two retinal images to the pineal gland, where corresponding points from the two retinae are merged and act upon the soul. At this point the work of sense is done and the mind (or understanding) takes over. The soul may compare this visual input with, say, input from the eye muscles, or integrate it with data from our memory, but it is the mind which does this and not the senses. Granted, this poses problems, since none of these supposed mental processes is accessible to introspection, but he is forced into this position because the senses have been reduced to mere channels for conveying motions and figures to the brain, and thus can not integrate the various sense fields. It must, thus, be

the mind, and not the senses, which corrects for the "imperfections" of the retinal image.

Thus, when the empiricists attempted to uncover the basic data of sense, they very naturally eliminated all those things whose perception involves the mind correcting for the defects of the retinal image, and took what our sense of sight yields us to be a two-dimensional pattern of colors structurally isomorphic with the retinal image. This, alone, they thought, is really seen, while all else is the result of judgment.

It was, then, these far-reaching changes which Descartes had made in the then-prevailing Aristotelean theory of perception which prepared the way for the rise of the sort of perceptual idealism we find in Berkeley's Essay Towards a New Theory of Vision.

The young Bishop Berkeley, then, who was nothing if not a clever strategist, perceived the potential for idealism already implicit in the theory of ideas, the subjectivization of light and colors, and the seeing/judging distinction. He saw that by integrating these strands of thought, and by drawing out and further developing their idealistic implications, he could forge a novel and very powerful argument for idealism -- an argument which would bring the prestige of science to bear in support of his immaterialism. Since our sense of sight is so central to how we think about the world, and because of the great popular

interest in works on optics, he hoped that a victory for idealism here would be a major victory for immaterialism and concommitantly a crushing defeat for his mechanistic opponents.

Since his argument for visual idealism relies upon the theory of ideas, the subjectivism of light and colors and the seeing/judging distinction as these had evolved through the Cartesian tradition, however, it is fair to say, in conclusion, that it was the far-reaching changes which Descartes had made in the Aristotelean theory of perception which made possible the rise of the sort of perceptual idealism we find in Berkeley's Essay Towards a New Theory of Vision.

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TITLE OF THESIS THE RETREAT FROM REALISM: PHILOSOPHICAL THEORIES OF VISION FROM DESCARTES TO BERKELEY

MAJOR PROFESSOR Prof. Dennis Wilson Stampe

MAJOR DEPARTMENT Philosophy

MINOR Economics

NAME Celia Rose Curtis Wolf

PLACE AND DATE OF BIRTH September 14, 1942

COLLEGES AND UNIVERSITIES: YEARS ATTENDED AND DEGREES

Smith College, B.A. cum laude 1964

Brown University, all but thesis for M.A. in Economics 1965-66

University of Wisconsin, Madison, attended 1968-72, Ph.D. Dec. 1984

MEMBERSHIPS IN LEARNED OR HONORARY SOCIETIES American Philosophical Association, Society of Christian Philosophers, Catholic Philosophical Association

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