INFORMATION TO USERS

This was produced from a copy of a document sent to us for microfilming. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help you understand markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure you of complete continuity.

2. When an image on the film is obliterated with a round black mark it is an indication that the film inspector noticed either blurred copy because of movement during exposure, or duplicate copy. Unless we meant to delete copyrighted materials that should not have been filmed, you will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed the photographer has followed a definite method in "sectioning" the material. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For any illustrations that cannot be reproduced satisfactorily by xerography, photographic prints can be purchased at additional cost and tipped into your xerographic copy. Requests can be made to our Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases we have filmed the best available copy.

University Microfilms International
300 N. ZEEB ROAD, ANN ARBOR, MI 48106
18 BEDFORD ROW, LONDON WC1R 4EJ, ENGLAND
ROGER BACON ON PERCEPTION: A RECONSTRUCTION AND CRITICAL ANALYSIS OF THE THEORY OF VISUAL PERCEPTION EXPOUNDED IN THE OPUS MAJUS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of the Ohio State University

By

Patrice Koelsch Loose, B.A., M.A.

* * * * *

The Ohio State University

1979

Reading Committee:
Ivan Boh
Peter K. Machamer
Robert G. Turnbull

Approved By

Co-Advisers
Department of Philosophy
VITA

September 12, 1949. . . . .

Born - Bronx, New York

1968-1971 . . . . . . . .

Honors Program, The Ohio State University, Columbus, Ohio

1971. . . . . . . . . . .

B.A. cum laude, The Ohio State University, Columbus, Ohio

1972. . . . . . . . . .

Phi Beta Kappa

1971-1975 . . . . . . . .

University fellow, The Ohio State University, Columbus, Ohio

1972-1974 . . . . . . . .

Teaching assistant, Department of Philosophy, The Ohio State University, Columbus, Ohio

1973. . . . . . . . . . .

M.A. The Ohio State University, Columbus, Ohio

1975-1979 . . . . . . . .

Assistant Professor of Philosophy, Augustana College, Rock Island, Illinois
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>VITA</td>
<td>ii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td><strong>PART I</strong></td>
<td></td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>1. The Platonic Theory of Vision</td>
<td>10</td>
</tr>
<tr>
<td>2. The Aristotelian Account of Perception</td>
<td>30</td>
</tr>
<tr>
<td>3. Augustine on Sense-Perception and Divine Illumination</td>
<td>76</td>
</tr>
<tr>
<td>4. Robert Grosseteste and the Philosophy of Light</td>
<td>141</td>
</tr>
<tr>
<td><strong>PART II</strong></td>
<td></td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>5. The Baconian Synthesis</td>
<td>179</td>
</tr>
<tr>
<td><strong>BIBLIOGRAPHY</strong></td>
<td>283</td>
</tr>
</tbody>
</table>
INTRODUCTION

My purpose in this dissertation is to reconstruct and provide a critical analysis of the theory of perception developed by Roger Bacon in the *Opus Majus*. I will attempt to explicate the particular psychological, epistemic, and theological doctrines embedded in Bacon's theory of perception. I take it that Bacon's theory has two aspects. One aspect is developed in his theory of optics and the anatomy of the eye. Sight is explicated entirely in terms of geometrical figures and principles. I do not intend to lay out Bacon's theory of geometrical optics in detail in this dissertation. The significance of this aspect of perception for my purposes is the concept that sight can be geometrically characterized, and consequently, the formal causes of purely perspectival science can be known with mathematical certainty. My concern is with the other aspect of perception, namely the cognitive aspect. I shall first examine what I take to be the psychological issues implicit in Bacon's discussion of the sensitive soul and its faculties. I will then turn to the epistemic implications of his treatment of the hierarchy of cognitive elements involved in perception. My ultimate aim is to show how the theory of perception derives from a
particular epistemic view that takes its own character
and motivation from Augustinian theological concerns. I
will be especially interested in the role of sensory
perception as preliminary to obtaining spiritual knowledge.

The scope of the *Opus Majus* is encyclopaedic, and
Bacon's genius is syncretic rather than innovative. Thus,
in order to reconstruct and analyze Bacon's theory, it is
necessary to isolate and evaluate the seminal historical
antecedents that shape his work. Hence, in the first
part of this dissertation I shall address myself to what
I take to be the four major influences on Bacon's theory
of perception: (1) the Platonic theory of vision, (2) the
Aristotelian account of sense perception, (3) the
Neoplatonic theology of St. Augustine, and (4) the "light
metaphysics" of Robert Grossteste.

The Platonic and Aristotelian accounts of perception
were of special significance to Medieval natural
scientists. Both Plato and Aristotle consider seeing the
superior sensory modality and thus concern themselves
primarily with visual perception. The emphasis on vision
as the epistemically privileged mode of perception
carries over to the Thirteenth Century; consequently, my
own emphasis throughout this dissertation will be on the
sensory and cognitive mechanisms involved in visual
perception. Again, my intent is not to provide a history
of analysis of ancient theories of perception (I am not, for example, going to discuss the Epicurean account of vision) but rather, I want to focus on those aspects of these early perceptual theories that were seminal to the development of the Medieval perceptual theories of Robert Grosseteste and Roger Bacon. In the case of Bacon particularly, I will show that there is a very strong connection between the science of optics and the philosophical/theological concerns of the acquisition of knowledge.

Chapter 1:

In the first chapter I set out the account of perception given by Plato in the Timaeus and the Theatetus. Plato advocates an extramission theory of vision which can best be interpreted as requiring the motion of particles in place rather than the transfer of particles through space. I claim that the treatment of the processes of sensory perception must be understood as deriving from Plato's metaphysics. The objects of sense perception are merely appearances in the unstable world of becoming, and are not objects of knowledge. This interpretation is based on arguments in the Theatetus and the Republic that perception is not knowledge.
Chapter 2:

In contrast to the predominantly metaphysical orientation of Plato, Aristotle approaches perception from the standpoint of the psychologist interested in the behavior of the organism interacting with its environment. My explication of the Aristotelian account of perception will follow Aristotle's own discussion in De Anima beginning with the objects of the special sense and the common sensibles, and proceeding to the various faculties of the sensitive soul. I shall then turn to the cognitive processes, and I will discuss at length the role of the active intellect, paying particular attention to W. D. Ross' interpretation of it as that by which one acquires knowledge of abstractions that are not presented in sense-experience. Whereas the passive aspect of nous acquires knowledge of universals exemplified by the objects apprehended by sense, the active intellect enables one to make purely theoretical inferences in metaphysics. (In the last chapter I will explain why Bacon mistakenly identifies the active intellect with God.)

Chapter 3:

I shall then proceed to the Augustinian theory of knowledge, which was to play a formative role in the development of medieval theology, particularly among the Franciscans. I shall discuss briefly Augustine's theory
that all knowledge is a function of the soul, and the role of memory in recognizing the objects of sensation. I will focus on Augustine's attempt to explain the nature of sense-perception. Augustine grants that perception is not merely some modification of the sense-organ, but involves the mind's being in some significant way aware of the modification. My concern is with Augustine's attempt to explain the mind's awareness without supposing that it is somehow caused or initiated by the sense-organ, since this would violate the basic Augustinian tenet that, whereas the soul can act on a body, body cannot act on the soul. I will also discuss the Neoplatonic thrust of Augustine's epistemology and theology that is perhaps most clearly evident in his theory of divine illumination. Augustine explains the doctrine of divine illumination by an analogy to the process of vision, an analogy that dominated Thirteenth Century Franciscan thought. (Bacon takes the theory of divine illumination as the paradigm of his own theory of vision. Thus, his theory requires the presence of a higher agency (i.e., the emanation of the visual species) in order for seeing to occur.)

Chapter 4:

The "light metaphysics" of Robert Grosseteste exemplifies the creative response to the major influences
on the twelfth- and thirteenth-century mind. The most pervasive of these influences was Christianity, and Grosseteste's light metaphysics were a literal application of the *Gospel of St. John*. The concept of divine illumination was, in large part, drawn from Augustinian Neoplatonism. In addition, Grosseteste was deeply influenced by Aristotle, in particular by the *Posterior Analytics* and the *Physics*. From the *Posterior Analytics*, Grosseteste derived his methodology of "resolution and composition," which made use of observation and analysis to advance from the particulars of sense to universals or general principles, and then to deduce from these general principles specific causal explanations.

I shall present a sketch of the hierarchical structure of the sciences and the relationship of the superior to the subordinate sciences—a relationship that exists between geometry and optics. Geometry provides the "reasons" for the "facts" of optics. The concern with optics and the mathematical certification of scientific hypotheses leads into a discussion of Grosseteste's theory of the role of sense-perception in coming to know. I will conclude this chapter with a critical examination of the species account of vision developed by Grosseteste emphasizing how, despite its pro Aristotelian biases, Grosseteste's attitude toward perception is susceptible to a rather Platonic
Chapter 5:

In the second part of this dissertation I shall, drawing from the previous chapters, explicate and evaluate Bacon's theory of visual perception. This chapter begins with a brief biographical sketch of Bacon's background and training and is meant to put the achievement of the Opus Majus in context. In assessing Bacon's work one must take into account both Bacon's position vis-a-vis his intellectual milieu and his own conception of the nature of his enterprise.

In order to appreciate this latter aspect, I treat at some length Bacon's idea of the role of the natural philosopher and the relation of philosophy to theology. This leads into a discussion of Bacon's notion of experimental science and the certitude that accrues to it. This in turn invites discussion of mathematical demonstration and its claims to yield certain knowledge.

This preliminary discussion is necessary to understand both the intent and content of Bacon's theory of visual perception. I contend that the structure of the section on optics in the Opus Majus is confusing and that Bacon's theory must be interpreted in the context of Bacon's larger concerns. Failure to do this
accounts in part for contemporary misunderstandings of Bacon's theory. Specifically, I shall show how Gareth Matthews' reading of Bacon as holding an intromissionist theory of vision is mistaken.

I then go on to explicate the theory of vision and to discuss the various cognitive faculties involved in perception. This leads to some discussion of the kinds of judgments made by each faculty as well as the status of the knowledge yielded by such judgments. Bacon leans heavily on Aristotle's De Anima and Avicenna's commentary on it. Bacon's own contribution emerges when he tries to explain what he takes to be authentic accounts of animal behavior in terms of the functions of the faculties in sentient but non-human creatures.

It is when Bacon tries to account for various perceptual errors that the empirical aspects of the extramissionist theory emerges most emphatically. Bacon fails to realize that his extramission theory is very much more like the Platonic theory of the Timaeus than the ostensibly intromissionist theory of De Anima. Bacon misunderstands the Platonic theory, believing that it requires the emission of visible particles from the eye. Clearly influenced by Grosseteste's work, Bacon provides an account of the extramission of species by the seeing eye that he believes to be in fundamental agreement with Aristotle and his Islamic commentators.
The discussion of the nature and function of species has both metaphysical and epistemic ramifications. I shall stress the significance of the epistemic complementarity of scientific and spiritual truths by showing how knowledge of natural phenomena fits in with an all encompassing theological framework. This last section will focus on Bacon's identification of the active intellect with God. I shall argue that for Bacon, scientific knowledge includes knowledge of final causes. The final cause is not given in sensory experience, but by the illumination of the active intellect. The Aristotelian epistemology is thus adapted to a thoroughly Augustinian theology and the Baconian synthesis effected.
My aim in this chapter is to present succinctly the Platonic account of visual perception. I shall indicate how the physicalistic account in the Timaeus is subordinate to Plato's metaphysical and epistemic commitments. I shall discuss only those aspects of Plato's account which are relevant to understanding in what way Grosseteste and ultimately Bacon adopt and misunderstand the Platonic position.

The Platonic account of vision is given in detail in the quasi-mythical Timaeus. It is an extramission theory of vision requiring the emission of a stream of fiery particles from the eye in order for seeing to occur. Plato claims that sunlight diffused in air is "the proper body of each day." (45b) The pure non-burning fire passing through the pupil coalesces with daylight, to form a "single homogeneous body" in a straight line. This is the "visual current" (or "visual ray"). When this homogeneous body encounters any object in its path, a motion is caused (by the motion of the body encountered). This motion passes back along the body until it comes into contact with the soul.
Seeing is a sensation, and it is worth noting that Plato claims that strictly speaking, sensation does not occur in the sense-organ, but in the soul.

Accordingly whenever there is daylight round about, the visual current issues forth, like to like, and coalesces with it and is formed into a single homogeneous body in a direct line with the eyes, in whatever quarter the stream issuing from within strikes upon any object it encounters outside. So the whole, because of its homogeneity, is similarly affected and passes on the motions of anything it comes in contact with or that comes into contact with it, throughout the whole body, to the soul, and thus causes the sensation we call seeing. (45c-d)

Plato further claims that the night air contains no fire and therefore the pure fire of the eye cannot coalesce with it. The visual fire streaming from the eye is quenched. (45b-d) If motion persists within the eye, even after the eyelid is closed and the body is at rest, then dreams occur.²

The theory, as given so far, is incomplete. One must account for the phenomenon of color. According to the Timaeus account, color is caused by "a flame which streams off bodies of every sort and has its particles so proportioned to the visual ray as to yield sensation." (67c) Color is that which is seen; it is the object of vision.³ The pure fire of the eye streams forth to form a homogeneous body with the daylight because like is attracted to like. In order for this
homogeneous body (the visual cone) to serve as the medium of sight, what is seen must be like the visual ray. Thus in order to be visible, bodies must be composed of a kind of non-burning fire.

Now that which comes to be must be bodily, and so visible and tangible; and nothing can be visible without fire, or tangible without something solid, nothing is solid without earth. (31b)

Plato claims that these fiery particles emanating from the physical objects may be either larger or smaller or of the same size as those particles of the visual ray. Those particles which are the same size are "imperceptible" or "transparent." The larger particles cause the visual ray to contract, and these particles are called "black," while the smaller particles cause the visual ray to dilate, and these are called "white." (67d-e)

In summary then, Plato's theory supposes that particles come out of the eye and mix with a complex of air and fire, thus forming the visual ray or stream. (It is important to note that there is never any suggestion that the visual fire that streams forth from the eye to form a body with daylight is itself visible.) At the same time, Plato supposes that all bodily objects whether colored or transparent are also giving off particles ("flame"). Plato accounts for vision (and
in fact all other sensory modalities) in terms of motion, because sensation occurs when motions, transmitted through a medium to the sense-organ, reach the soul.

The whole thrust of the discussions in the *Timaeus* with respect to perception and sensation, and the analysis of the processes of perception in the *Theaetetus* is based primarily on motion. It is reasonable to suppose then that Plato holds that vision is a consequence of a motion passed along the visual ray, a motion caused by the impact of the visual ray's striking the sympathetically firey surface of a physical object, rather than vision as the *acquisition* by the eye of lively fire-particles emitted by the object. The characterization of colors as a flame streaming off is somewhat problematic and, I suggest, ultimately misleading.

This very physicalistic account of vision needs to be viewed in the larger context of Plato's general characterization of the nature of physical phenomena. In the *Timaeus*, Plato claims that given the premise that the physical world is an inferior, unstable reflection of the world of Forms, the formation of an exact physical science is an impossible task. There is an element of chaos or chance in the world, thus there can be causal variation and inconsistency. The role
of chance is suggested by a remark in the Timaeus regarding the mixture of particles of bright red and white which produce orange: "In what proportions they are mixed it would be foolish to state, even if one could know; the matter is one in which no one could be moderately sure of giving either a proof or a plausible estimate." (68b) One can postulate very general scientific schemata, but one cannot guarantee mathematical exactness in all physical sciences. One cannot simply assume that mathematically reliable laws are instantiated in the particular events of the world. Given the tenuous nature of the perceptual experience (and this will become clearer in subsequent discussion) observation alone is insufficient to justify claims for such laws. It is only in cases where there are additional, non-experiential reasons for mathematically reliable laws holding does Plato admit them. Plato maintains that the celestial bodies move with mathematical regularity so that mankind can recognize the passage of time and learn to calculate. In making the celestial bodies conform to mathematically regular behavior, the demiurge acts deliberately and benevolently for the sake of men who will observe the heavens. This teleological emphasis in the scientific explanation, emerges again in Plato's discussion of vision.
Since it is not the purpose of the *Timaeus* to provide an extensive explanation of the cognitive activity involved in perception, I shall turn to other Platonic dialogues for such discussion. In particular, I shall be concerned with the relevant sections of the *Theaetetus* and the *Republic*.

The major thesis of the *Theaetetus* is that perception is not knowledge. I shall argue that for Plato the immediate objects of perception come into being in the act of perceiving, whereas the objects of knowledge always exist. The enormity of the disparity between apprehending the changing world of appearances and knowing the unchanging world of intelligible Forms is developed in the *Republic*. It is only in light of Plato's insistence that the objects of knowledge must be permanent and unchanging, that his critical attitude toward explanations of natural phenomena can be fully appreciated.

Plato's concern with the theory of visual perception is ultimately teleological. Vision is the primary instrument for acquiring information (beliefs and opinions) about the physical world. On another level however, the perceptual experience can be helpful as a metaphorical device for suggesting how one can come to have a genuine understanding of the unchanging
realm. (This is an idea that will be developed by Bacon in detail.) In the explanation of the allegory of the cave in the Republic, Socrates states:

The prison dwelling corresponds to the region revealed to us through the sense of sight, and the Fire-light within it to the power of the Sun. The ascent to see the things in the upper world you may take as standing for the upward journey of the soul into the region of the intelligible... In the world of knowledge, the last thing to be perceived and only with great difficulty is the essential form of Goodness. Once it is perceived, the conclusion must follow that for all things, this is the cause of whatever is right and good; in the visible world it gives birth to light and to the lord of light, while it is itself sovereign in the intelligible world and the parent of intelligence and truth. Without having had a vision of this Form no one can act with wisdom, either in his own life or in matters of state. (517c)

In the Republic, perception of the visible world is compared to observing and speculating about the flickering shadows of images within a cave. The implicit suggestion is that perception is unreliable as a mode of gaining genuine knowledge since the objects of perception are always changing. This is underscored by the discussion in the Theatetus with respect to the Heraclitean view that the physical universe consists entirely of motion. However, perception can be an initial step in the acquisition of real knowledge. Plato argues in the
Timaeus that the value of the sense of sight is ultimately
teleological. When used properly, vision can be
instrumental in coming to know metaphysical and moral
truth. This is, of course, one aspect of Plato's
doctrine of reminiscence:

Sight, then, in my judgement is the
cause of the highest benefits to us
in that no word of our present dis­
course about the universe could
ever have been spoken, had we
never seen stars, Sun, and sky.
But as it is the sight of day
and night, of months and the re­
volving years, of equinox and
solstice, has caused the inven­
tion of number and bestowed on
us the notion of time and the
study of the world: whence have
derived all philosophy, than which
no greater boon has ever come or
shall come to mortal man as a
gift to heaven . . . the god in­
vented and gave us vision in or­
der that we might observe the circuits
of intelligence in the heaven
and profit by them for the
revolutions of our own
thought, which are akin to them,
though ours is troubled and they
are unperturbed; and that, by
learning to know them and ac­
quiring the power to compute them
rightly according to nature, we might
reproduce the perfectly unerring
revolutions of the god and reduce
to settled order of the wandering
motions in ourselves. (47-47c)

I shall, at this point, suggest how certain
epistemic and metaphysical views that Plato holds
affect his formulation of the roles that motion,
sensation, and the soul play in the perceptual process.
At the beginning of this chapter, I quoted a passage from the *Timaeus* that illustrates the Platonic claim that speaking precisely, sensation occurs in the soul. In the *Theatetus*, Plato distinguishes first between the object and the sense-organ. He then introduces a third element in the process—the mind (i.e. intellective part of the soul). In the following passage from the *Theatetus*, Plato argues that the intellective part of the soul is required for perception to occur since the mere affectation of the physical sense-organ is not sufficient to explain the coherent nature of ordinary perceptual experiences:

> . . . it would surely be strange that there should be a number of senses en- sconced in us, like the warriors in the Trojan horse, and all these things should not converge and meet in some single nature— a mind or what ever it is to be called— with which we perceive all the objects of perception through the senses as instruments. (184d)

Plato, taking as axiomatic the claim from the *Republic* that different faculties have different objects, then argues that each sensory faculty has its own exclusive objects. One can, however, perceive both the sounding instrument and the colored object at the same time (though not with the same organs), and moreover, one can judge that both the sounding instrument and the colored object exist or have duration. Since the objects of the
sensory faculties are distinct, one must account for the judgment that common terms apply to different sensations. The answer is that

... there is no special organ at all for these things, as there is for the others. It is clear... that the mind in itself is its own instrument for contemplating the common terms that apply to everything. (185ε)

The purely mechanical account of visual perception as motion must be supplemented by an account of the cognizing processes involved in perception. If perception can be instrumental in coming to know the Forms, as suggested by the theory of recollection, then the soul must be able to manipulate such instruments. (The idea of the user-tool analogy becomes central to understanding Plotinus and Augustine.)

In the Theatetus, Plato explains the conditions that are requisite in order for a person to have perceptual experiences, and what actually occurs in the experience.

[The] first principle... is that the universe, really is motion and nothing else. And there are two kinds of motion. Of each kind there are any number of instances, but they differ in that the one kind has the power of acting, the other the power of being acted upon. From the intercourse and friction of these with one another arise offspring endless in number, but in
pairs of twins. One of each pair is something perceived, the other a perception, whose birth always coincides with that of the thing perceived. Now, for the perceptions we have names like 'seeing,' 'hearing,' 'smelling,' 'feeling cold,' 'feeling hot,' and again pleasures and pains and desires and fears, as they are called, and so on. There are any number that are nameless, though names have been found for a whole multitude. On the other side, the brood of things perceived always comes to birth at the same moment with one or another of these—with instances of seeing, colors of corresponding variety; with instances of hearing, sounds in the same way; and with all other perceptions, the other things perceived that are akin to them. (156-156c)

The perceptual experience is a consequence of the "union" or "intercourse" of active and passive forces—a union which generates both the perception and that which is perceived. The perception and the perceived thing are ontologically dependent. There can be no seeing without a seen thing (e.g., a colored object). Plato elaborates on this in the following way:

The point is that all these things are, as we were saying, in motion; but there is a quickness or slowness in their motion. The slow sort has its motion without change of place and with respect to what comes within range of it, and that is how it generates offspring; but the offspring generated are quicker inasmuch as they move from place to place and their motion consists in change of place. As soon, then, as an eye and something else whose structure is adjusted
to the eye come within range
and give birth to the white-
ness together with its cognate
perception--things what would
never have come into existence
if either of the two had approached
anything else--then that is that,
as the vision from the eyes and the
whiteness from the thing that joins
in giving birth to the color pass
in the space between, the eye be-
comes filled with vision and now sees,
and becomes not a vision, but a
seeing eye; while the other par-
ent of the color is saturated
with a whiteness and becomes,
on its side, not a whiteness
but a white thing, be it stock or
stone or whatever else may chance to
be so colored. (156c-e)

Thus, with respect to the account of vision
given in the *Timaeus*, it seems plausible to interpret
the "slow motion" as the color in a physical object and
the "quick motions" are those which now characterize
the homogeneous body (i.e. the visual ray) that is the
medium of an actually seeing eye. Consequently, the
"quick motions" cause sensation in the soul. This
supports my contention that Plato's theory of vision
ought to be interpreted as requiring motion of particles
in place, but not the spatial transfer of particles
from object to eye. Thus, in "slow motion" there is no
change of place--i.e., the object (collection of
particles) remains intact and undiminished. This is
consistent with the claim that sensory qualities are
potential and depend upon a percipient to make them
actual. A particular quality, e.g., the whiteness of a cloak can thus be accounted for with respect to a particular motion (or set of motions) causally generated by the impact of the particles of the visual ray upon the particles of the object. It seems then that if men were not sighted, there would be no colors, although objects would have a disposition to be colored. The "whiteness" is both a dispositional property of the object, to become or to be seen as a white thing (or, alternatively, to be perceived whitely) as well as a dispositional property of the percipient to see white things.

And so, too, we must think in the same way of the rest—'hard,' 'hot' and all of them—that no one of them has any being just by itself (as indeed we said before), but that it is in their intercourse with one another that all arise in all their variety as a result of their motion; since it is impossible to have any 'firm notion' (as they say) of either what is active or what is passive in them, in any simple case, as having any being. For there is no such thing as an agent until it meets with its patient. Also what meets with something and behaves as agent, if it encounters something different at another time, shows itself as patient.

The conclusion from all this is, as we said at the outset, that nothing is one thing just by itself, but is always in process of becoming for someone, and being is to be ruled out altogether, though, needless to say, we have been
betrayed by habit and inobservance into using the word more than once only just now. (156e-157b)

The key to translating linear and delineated mechanisms of vision into the incessant process of perception is to be found in the following discussion of Plato's metaphysical and epistemic commitments. I shall show that the emphasis on "becoming," as the characteristic of perceptual experience, (i.e., "becoming" characterizes the objects of the perceptual experience and the experience insofar as it is the process by which perception occurs) is consistent with the description of the cosmos and its contents.

The information acquired by the soul via sensation is merely information about a temporary state of affairs. Thus, while the soul is immediately aware of perceiving red, the eye is seeing red, and the perceived object is red. When the sensations (i.e., motions) are terminated (as when the eye is closed), the conditions for seeing and being seen are no longer present and the "twins" (i.e. the seeing of colors and the colored things) cannot be generated.

It is important to remember that the thrust of the discussion of perception in the Theatetus is ultimately negative. Perception is not knowledge. Moreover, strictly speaking, perception is not only not identical with knowledge, but it cannot truly be a species of
knowledge at all. The epistemic value of statements about the nature of particular perceptual experiences is discussed in The Sophist.

. . . And suppose judgement occurs, not independently, but by means of perception, the only right name for such a state of mind is 'appearing'. . . Well then, since we have seen that there is true and false statement, and of these mental processes we have found thinking to be a dialogue of the mind with itself, and judgement to be the conclusion of thinking, and what we mean by 'it appears' a blend of perception and judgement, it follows that these also, being of the nature as statement, must be some of them and on some occasions, false. (264b)

Perception, as noted earlier in the case of seeing, occurs when the "motions" reach the soul. To use contemporary philosophical jargon, "being appeared to," in Plato's account, consists in the motions giving rise to sensation in the soul, which in turn forms a judgment concerning the contents of the World of Becoming. This is the way in which a person acquires true or false beliefs about the physical world. Strictly speaking, events in the World of Becoming are not objects of knowledge:

That which is apprehensible by thought with a rational account is the thing that is always unchangeably real; whereas that which is the object of belief together with unreasoning sensation is the thing that becomes
and passes away, but never has real being. Again, all that becomes must needs become by the agency of some cause; for without a cause nothing can come to be. *(Timaeus 28)*

What is eternal is intelligible. The objects of knowledge are "unchangeably real," whereas the objects of mere sensory perception are transient phenomena. This is, of course, a rudimentary statement of the doctrine of the Forms. Embedded in this brief passage is the claim that the sensorially perceived world is temporal and temporary, and there is the further important claim that the phenomenal appearances, the objects of belief, have causal antecedents.

Both the **immediate** objects of perception (e.g. the white, the soft), appearances and the causes of those appearances, namely, the physical world and its components are always in a process of becoming. Since they are always in a process state, they cannot be the objects of knowledge, but merely the objects of belief. One argument for this is found in the *Republic*, where Plato draws the distinction between the objects of belief and the objects of knowledge. The distinction brings the epistemic and ontological issues more sharply into focus:

If it is of the nature of a different faculty to have a different field, and if both knowledge and
belief are faculties and, as we assert, different ones, it follows that the same things cannot be possible objects of both.

So if the real is the object of knowledge, the object of belief must be something other than the real. . . .

Can it be unreal? Or is that an impossible object even for belief? Consider: if a man as a belief, there must be something before his mind; he cannot be believing nothing can he? . . .

Now we said that ignorance must correspond to the unreal, knowledge to the real. So what he is believing cannot be real nor yet unreal. . . .

. . . if some object could be found such that it both is and at the same time is not, that object would lie between the perfectly real and the utterly unreal; and that the corresponding faculty would be neither knowledge nor ignorance, but a faculty situated between the two. . . .

It seems then that what remains to be discussed is that object which can be said both to be and not to be and cannot properly be called either purely real or purely unreal. If that can be found, we may justly call it the object of belief, and so give the intermediate faculty the intermediate object, while the two extreme objects will fall to extreme faculties. (478b-e)

The objects of belief are, of course, the sensible appearances. Plato seems to be claiming that individual appearances are imperfect exemplars or representations.
of the Forms. They cannot be "purely real" because they are limited by temporal duration, and the condition of spatiotemporal limits are antithetical to the concept of an immutable and eternal Form. Particular appearances can, however, elicit in the soul the recognition of a universal Form. Thus, appearances are intermediaries between the "purely real" and the "purely unreal."

Earlier in this chapter I argued that in the Platonic account of perception, the mind uses the senses as instruments, and that it provides the connection between the purely mechanical and the cognizing aspects of vision. I think this claim can, given the above, be augmented. The mind cannot only make judgments concerning the sensory data (e.g. the sensation that is the seeing red), but, in the case of vision, it would seem that the soul or mind plays an active role insofar as it exercises control over what is seen. Thus, when noticing occurs, the thing noticed becomes a noticed thing. (This active or selective aspect of the soul in perception will become a central focus of my treatment of Augustine.)
Footnotes:  Chapter 1

1 The Timaeus translation used is that of F. M. Cornford in Plato's Cosmology (Indiana: Bobbs-Merrill, 1957).


3 The account of color in the Timaeus is ambiguous and puzzling. The effect of the flame particles with regard to the perception of particular color seems to depend on the size and shape of these particles. David C. Hahm discusses the difficulties in the Platonic account in "Early Hellenistic Theories of Vision and the Perception of Color" in Studies in Perception, ed. Peter K Machamer and Robert G. Turnbull (Columbus, Ohio: The Ohio State University Press, 1978), pp. 60 - 95.

4 Timaeus (38c - 39e).

5 Translations are from F. M. Cornford's The Republic of Plato (Oxford, 1941).


7 Again, the translations are Cornford's: Plato's Theory of Knowledge (Indiana: Bobbs-Merrill, 1957). This book contains both the Theatetus and the Sophist.

8 Republic (477).
For a discussion of the special and common sensibles see Robert G. Turnbull's "The Role of the 'Special Sensibles' in the Perception Theories of Plato and Aristotle," in Studies in Perception, pp. 3-26, op. cit. footnote 3.

Theatetus (196e).
Chapter 2: The Aristotelian Account of Perception

Aristotle's account of perception can be regarded as one aspect of his general attempt to give a cohesive and consistent explanation of natural phenomena. In comparison with the Platonic account, there is a more extensive treatment of sense and perception in the Aristotelian corpus. Throughout this chapter, I will be presenting what I take to be the usual and uncomplicated reading of De Anima, emphasizing those facets of Aristotle's account which are especially salient for Bacon. Hence, I will focus much of my discussion on the nature of the perceptual experience and the role of the active intellect.

Aristotle's theory of perception plays a more central role in his general philosophy than Plato's theory does in his philosophy. Plato's interests seem to be largely restricted to metaphysical, epistemic and moral issues. The disclaimer that the Timaeus account is only a "likely story" (Timaeus 29d) is but one indication of the second class status of the study of the natural sciences. Plato was primarily concerned with providing an account of perception that would cohere with the privileged ontological status of the Forms and the
doctrine of reminiscence.

I have argued in the preceding chapter that the perceptual theory, as I have reconstructed it from remarks made in the *Timaeus* and the *Theatetus*, when evaluated in terms of its philosophical importance is an auxiliary theory as compared to the metaphysical and epistemic theories embodied in the doctrine of the Forms. Plato's concern is almost entirely with the very limited and indirect role of perception in coming to know. Perception, strictly speaking, enables one to acquire beliefs about the physical world. Given the theory of recollection, the "stuff" of beliefs can evoke knowledge of the universal Forms.

In contrast to what I have characterized as the rather restricted role of perception within the Platonic enterprise, Aristotle's account of perception, including his treatment of sensation, is central to his philosophical program. In addition to this issue of the importance of the perceptual account, there is the further issue of what kind of account was considered necessary to provide an adequate explanation of the phenomena of perception. Very roughly, Plato (and his predecessors Anaxagoras, Democratus, and Empedocles) seem to try to explain perception in terms of the mechanical motions of particles of matter, thus it would
seem attempting to reduce biology to physics. For example, Plato explains vision in terms of "quick motions" between the seeing eye and the thing seen, and color perception occurs when the firey particles on the surface of a visible object cause a motion in the visual stream.

Aristotle seems to shift emphasis from explanation in terms of the motions of particles to explanation in terms of the function of larger and more complex biological structures. This shift gets at a crucial distinction between the Platonic and Aristotelian philosophical orientations. For example, in both Plato and Aristotle the soul is sentient, but Plato approaches the soul from an epistemic and metaphysical viewpoint. In the Theatetus, Plato's most elaborate discussion of perception, Plato emphasizes the inferior status of perceptual awareness. In contrast, Aristotle's theory of perception is essential to his analysis of the nature of the soul. Aristotle's analysis begins from the standpoint of the biologist. In De Anima the soul is described by Aristotle as "the first grade of actuality of a natural organized body" (412b - 5). Moreover, he defines the soul as "substance in the sense which corresponds to the definitive formula of a thing's essence. That means it is the 'essential whatness' of a body of the character just assigned (412b - 10-11).
Theoretically then, the soul is the "essential whatness" of a living organism. Aristotle starts his discussion of the soul by considering the most basic and universal activities of all living creatures. He begins with the nutritive soul, a soul that is basic to plants and animals. In addition, animals also have a sensitive soul. Within the class of animals, only humans have a rational soul.

Aristotle must explain how an organism can possess more than one kind of soul. In order to understand Aristotle's explanation, let us look carefully at the functions of the various kinds of souls. A plant has the ability to assimilate food (thus we infer that it has a nutritive soul), while a plant does not have the ability to see or feel. It should be remarked here, somewhat prematurely, that Aristotle states that a sense is "what has the power of receiving into itself the sensible forms of things without the matter" (424a - 24). Hence, specific physical organs are required for perception, such as eyes or nerves (since Aristotle maintains that flesh is the medium of touch and not the organ (423b - 25). Plants do not have such organs per se, nor do they possess parts obviously equivalent functionally to organs. Thus it seems reasonable for Aristotle to conclude that plants are not sentient, since they do not have the biological structures through which the sensitive
soul operates.

Animals, however, have both nutritive and sensitive capacities. The question arises whether animals then have (at least) two distinct souls, or whether it is the case that the sensitive soul is an extension or development of the nutritive soul and not a distinct entity. Aristotle's response is to insist upon the unity of soul and the homogeneity of its specific powers.

The soul is the "essential whatness," or that which transforms a potentially living organism into an actually living organism, thus one can interpret Aristotle as claiming that in order to be an actually living plant, it must be able to assimilate food, and in order to be an actually living animal it must have the capacity both to eat and to sense. The talk of kinds of soul (e.g. nutritive, sensitive, etc.) does not mean that there are two or more autonomous souls within an animal, but rather than an ensouled animal has the capacity to eat and the capacity to sense. An organism has only one soul, one "essential whatness," but the soul in some creatures has diverse faculties (i.e. abilities and capacities) depending on the kind of an organism it is but these faculties are homogeneous, insofar as they constitute that kind of organism. Thus in man the soul has not only nutritive and sensitive
faculties, but also a rational faculty.

In the De Anima Aristotle gives a general criticism of the Pythagorean and, perhaps derivitive, Platonic theories of soul. These remarks are especially significant because it is here that Aristotle lays out what he takes to be the sorts of issues that any adequate theory of the soul must treat. Moreover, it reiterates Aristotle's concern with explanation in terms of function.

The view we have just been examining, in company with most theories about the soul, involves the following absurdity: they all join the soul to a body, or place it in a body, without adding any specification of their union, or of the bodily conditions required for it. Yet such explanation can scarcely be omitted; for some community of nature is presupposed by the fact that the one acts and the other is acted upon, the one moves and the other is moved; interaction always implies a special nature in the two interagents. All, however, that these thinkers do is to describe the specific characteristics of the soul; they do not try to determine anything about the body which is to contain it, as if it were possible, as in the Pythagorean myth, that any soul could be clothed upon with any body - an absurd view, for each body seems to have a form and shape of its own. It is absurd to say that the art of carpentry could embody itself in flutes; each art must use its tools, each soul its body. (407b - 14-26)

In this passage Aristotle states that one has not adequately discussed the soul until one discusses what it is that the soul enables a particular
body to do. The body is the tool of the soul, and that soul can function only within the limits of the body. If the body is damaged, the soul’s ability to perform its function will be impaired. The function of the sensitive soul is impaired by the physical condition of the eye of the blind person, just as the skill of the carpenter is impaired by the damaged condition of his tools.² (In another passage Aristotle states that “if the old man could recover the proper kind of eye, he would see just as well as the young man. The incapacity of old age is due to an affectation not of the soul but of its vehicle...” (408b - 22-23).

The Aristotelian explanation of the soul trades heavily on analogies. In particular, Aristotle appeals to our intuitions about the seeing eye to explain the function of the soul, insofar as the soul can be characterized as the "essential whatness" of a thing.

Suppose that the eye were an animal-sight would have been its soul, for sight is the substance or essence of the eye which corresponds to the formula, the eye being merely the matter of seeing; when seeing is removed the eye is no longer an eye, except in name - it is no more a real eye than the eye of a statue or a painted figure. (412b - 19-21)

This rather quick definition of soul is then refined and made more precise: "soul is an actuality or
formulable essence of something that possesses a potentiality of being besouled." (414a - 27)

At the beginning of Book II, Chapter 4 of De Anima, Aristotle's methodological principles for investigating more precisely the nature of soul are clearly stated. Aristotle argues that if one wants to know a certain form of soul or its properties, one must examine the function of that soul:

... for in the order of investigation of the question of what an agent does precedes the question, what enables an agent to do what it does. If this is correct, we must on the same ground go yet another step farther back and have some clear view of the objects of each; thus we must start with these objects, e.g. with food, with what is perceptible, or with what is intelligible. (415a - 17-22)

Clearly then, in order to understand the function of the sensitive soul, one must first examine the objects of sense. Aristotle distinguishes between three kinds of "objects of sense." Two kinds of objects of sense are directly perceptible. The first kind is perceptible by a single sense alone--these are the special or proper objects of sense (e.g. sight perceives color and light exclusively, just as hearing perceives sound exclusively). The other kind of object or direct perception is that class of percepts that can be apprehended by more than one of the senses. These
"common sensibles" are movement, rest, number, figure, and magnitude. The third kind of object of sense is an "incidental object of sense," that is, where what the perceived object is (e.g. the son of Ariston or the student of Socrates), is incidental to its directly perceptible appearances (e.g. a moving white figure). The incidental objects of sense do not affect the senses qua what makes the term "incidental" applicable to them. The eye perceives the moving white figure whether or not the perceiver is aware that it is the son of Ariston. Who or what the moving white figure is does not affect the physiological processes of the eye, whereas that there is a moving white figure does affect the physiological processes of the eye.

Strictly speaking, the perceived object and the incidental object are the same object, but under different descriptions. (e.g. "What do you see?" "A white figure, moving."; "What do you see?" "The son of Ariston, approaching."

In De Anima Aristotle defines the five special senses with respect to their proper objects. For example, sound is the object of hearing, color and light are the objects of sight. The judgments of the special senses are incorrigible insofar as sight cannot be mistaken that it discerns color, nor hearing that it discerns sound, although the sense, in the case of seeing
may not be able to recognize what it is that is colored, or, in the case of hearing, what the source of the sound is.

The object of sense is an integral part of the sensation. When the objects of sense are excessively strong or weak, the function of the sense is either impaired or destroyed. (426b - 7-10) The elucidation of this occurs in Book II, Chapter 12. Aristotle explains that the word "sense" can also mean:

... 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, i.e. in what ratio its constituents are combined.

By 'an organ of sense' is meant that in which ultimately such a power is seated.

The sense and the organ are the same in fact, but their essence is not the same. 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. This enables us to explain why objects of sense which possess one of two opposite sensible
qualities in a degree largely in excess of the other opposite destroy the organs of sense; if the movement set up by an object is too strong for the organ, the equipoise of contrary qualities in the organ, which just is its sensory power, is disturbed; it is precisely as concord and tone are destroyed by too violently twanging the strings of a lyre. (424a - 17-32)

The special organs of sense take on the forms of the qualities ascribed to their objects. Sense can be thought of as the power that enables the particular qualities of an object to be perceived. Without such a power the particular sensible qualities would not truly be sensible. What is essential to sense is that it has the power of being sensitive. 5

In a sense even that which sees is colored; for in each case the sense-organ is capable of receiving the sensible object without its matter. (425b - 23)

Aristotle argues further that there is no special sense organ involved in the perception of the common sensibles (viz., movement, rest, figure, magnitude, number, and unity), but, nonetheless, they are perceived directly by the sensitive subject through one or more of the organs of sense. He maintains that "the faculties of knowledge and sensation are potentially their objects, the one what is knowable, the other what is sensible." (431b - 25-26) The ontology of potency and act is
thus so structured that the actuality of the object qua sensible is realized simultaneously with the actuality of the faculty. Without a percipient, the sensible object is merely a possible object of sense. The interpretation of the concepts of potency and act (and the processes by which the potential becomes actual) becomes crucially important in medieval epistemology, and figures significantly in the formulation of theories of perception.

The discussion of the nature of sense and Aristotle's insistence on the importance of the potential/actual distinction leads into a consideration of the connection between the activity of the sensitive faculties and the activity of the rational faculty. The elucidation of this connection will be of major concern in subsequent discussion. A statement of the functions of the activities of the sensitive and the rational faculties of soul is found in the following passage:

... the soul is in a way all existing things; for existing things are either sensible or thinkable, and knowledge is in a way what is knowable, and sensation is in a way what is sensible: in what way we must inquire.

Knowledge and sensation are divided to correspond with the realities, potential knowledge and sensation answering to potentialities. Within the soul the faculties of knowledge and sensation are potentially these objects, the one what is knowable, the other what is sensible.
They must be either the things themselves or their forms. The former alternative is of course impossible: it is not the stone which is present in the soul but its form.

It follows that the soul is analogous to the hand; for as the hand, is a tool of tools, so the mind is the form of forms and sense the form of sensible things.

(431b - 20 - 432a - 2)

Eye and mind function analogously: just as Aristotle claims that when the eye sees color, the eye-jelly becomes colored, so, too, when the mind knows, it takes on the form of the thing known. More significantly, however, the sensitive and rational faculties act in ontologically parallel ways: each has the power to make what is merely potential, actual. Sense is that which has the power of being sensitive. Mind is that which has the power of coming to know. Just as the sensible object is not an actually sensible object until it is the object of an actually sensing sense, so the objects of knowledge are not actual objects of knowledge until a thinking mind apprehends them.

Soul is essential to a completed or realized ontology. When the sensible qualities are perceived, and when the intelligible natures of things apprehended, then those things are transformed from potentially sensible to actually sensible, from potentially knowable
to actually known. The powers of the sensitive and rational faculties complete and perfect the cosmos insofar as they make what is merely potential, actual. Animals and men become actual knowers.

Aristotle maintains that thought is originally dependent on sense for its contents. Since according to common agreement there is nothing outside and separate in existence from sensible spatial magnitudes, the objects of thought are in the sensible forms, viz. both the abstract objects and all the states and affectations of sensible things. Hence (1) no one can learn or understand anything in the absence of sense, and (2) when the mind is actively aware of anything it is necessarily aware of it along with an image; for images are like sensuous contents except in that they contain no matter. (432a - 2-7)

Aristotle maintains that when the mind is thinking, the objects of thought are images which, in some way, resemble the contents of sensory experience. The contents of sensory experience are always consequences of causal process—for example, given the object and the medium and the nature of the sense, the sense is transformed from a potentially seeing eye to an actually seeing eye. What is seen is, in part, a consequence of the optical conditions in the environment and in the eye itself. Such conditions are causally effacious in bringing the potentially seeing eye to an actualized
state of seeing. They are necessary, but not sufficient however. In addition, there must be the power to be an actually seeing eye. This power is in the sense itself, or, more properly is the sense itself. Thinking is somewhat like sensing, but without the material causal component. Form without matter is the object of thought. The images in the mind are the forms.

The close similarities between sensing and thinking are reiterated and expanded in the following passages: "To perceive then is like a bare asserting or knowing," (431a - 8) and

To the thinking soul images serve as if they were contents of perception (and when it asserts or denies them to be good or bad it avoids or pursues them.) That is why the soul never thinks without an image. The process is like that in which the air modifies the pupil transmits the modification to some third thing (and similarly in hearing), while the ultimate point of the arrival is one, a single mean, with different manners of being. (431a - 14-19)

The images which are the contents of perception are the forms of the perceived concrete objects (i.e. the complex of the special and common sensibles). Sometimes it can be asserted that the images or forms are either good or bad, and then the entity (that's image or form is being apprehended) is pursued or avoided. Since most animals pursue other creatures and objects, they are in some primitive sense aware of them as
good (qua desirable) or bad (qua undesirable). It would seem at this point that Aristotle would want to claim that in order for the complex of special and common sensibles to be regarded as good (desirable) or bad (undesirable), that the complex must be considered as an incidental object of sense. Aristotle does not specifically acknowledge this, but remarks in the text of De Anima seem to be compatible with and, occasionally, even supportive of such a claim. He allows that "the sensitive . . . cannot be easily classed as either rational or irrational." (432a - 30) This seems to allow for some kind of cognitive activity (i.e. the apprehension of that which is, strictly speaking, incidental to perception) on the part of sentient creatures.

The difficulty is, in part, to explain how, if the sensitive faculty is in some manner aware of form, this awareness be characterized so that the distinction between sensing and thinking can be preserved. Let me begin by formulating what I take to be Aristotle's position by citing fully Aristotle's remarks on the relation of the sensible objects and their images:

In a sense even that which sees is colored; for in each case the sense-organ is capable of receiving the sensible object without its matter. That is why even when the sensible objects are gone the sensings and imaginings
continue to exist in the sense organs. (425b - 23-25)

The comments in the first part of this passage refer to Aristotle's claim, noted previously, that when the eye is actually seeing, the eye-jelly itself becomes colored. The remarks in the second part of this passage can be rather easily related to some ordinary sensory experiences. The persistence of the form of the perceived object would account for visual after-images, and perhaps even the pain that one feels in his foot for several seconds after it has been stepped on. However, the difference between the persistence of an object's form in the sense-organ (i.e. the physical alteration of the sense-organ) as opposed to the continued awareness of the form of the object in the soul, is not really clear.

It is, by now, sufficiently clear that Aristotle maintains that the substance (what a thing is—e.g. gold or bronze) is incidental to sensation, while the connection between the particular sensible quality and the sense is necessary. All seeing is seeing color and light, all hearing is hearing sound, all smelling is smelling odor. That the color is a property of the beard of Socrates, that the sound is a property of the plucked lyre, and that the odor is a property of the incense is incidental to sensing per se.
Moreover, Aristotle suggests that the seeing of color, the hearing of sounds, etc., does involve awareness of some sort. This suggestion occurs when he addresses himself to the question of whether colors and odors can have an effect upon "what cannot smell . . . [and] what cannot see by colors." (424a - 5) He responds by saying:

Is not the true account of this, that all bodies are capable of being affected by smells and sounds, but that some being acted upon, having no boundaries of their own, disintegrate, as in the instance of air, which does become odorous, showing that some effect is produced on it by what is odorous? But the smelling is more than such an affectation by what is odorous—what more? Is not the answer that, while the air owing to the momentary duration of the action upon it of what is odorous does itself become perceptible to the sense of smell, smelling is an observing of the result produced? (424b - 14-19)

In this passage Aristotle seems to be claiming that sensing is an awareness—at least insofar as observing entails awareness. What this claim amounts to though appears to be somewhat problematic, and has generated considerable discussion among twentieth century scholars. Sir David Ross maintains that there is an ambiguity inherent in Aristotle's discussion of the reception of froms by the sentient creature. Ross poses the problem in this way:

Now, if this assimilation of the organ
to the object takes place, it does nothing to explain the essential fact about perception, that on this physical change supervenes something quite different, the apprehension by the mind of some quality of an object. It is only if reception of form means awareness of form that it is a true description of perception; the description of the organ as becoming qualified by the form of its object is irrelevant. The phrase 'receptive of form' covers a radical ambiguity.

In this passage Ross seems to force Aristotle into a Cartesian dualism where the mind must apprehend the bodily transformation (e.g. the mind must notice that the eye is seeing red). I want to argue contra Ross that Aristotle does not lend himself to such a Cartesian reading. The Aristotelean concept of sense-perception cannot be successfully unpacked within a Cartesian frame of reference. Descartes and Aristotle have radically different ontologies and metaphysics. (For Descartes there is the simple ontological duality of spiritual and physical; Aristotle holds a more complex theory of substance.) I suggest that what strikes one now as problematic about Aristotle's treatment of the awareness of form in sense-perception, is largely a consequence of a Cartesian heritage. The following remarks by John Randall are particularly helpful in indicating how different the Aristotelean
conceptual schema is from the Cartesian:

In other words, for Aristotle sensing is a 'natural' or 'physical' process, it is in no sense a 'mental' one. For him sensing and sense images, phantasmata, are not 'mental,' they are physical. In Aristotle and the whole Aristotelean tradition, the line is drawn between sensing and 'nousing,' between sensing the particular and knowing the universal, not between 'body' and 'mind.'

One cannot draw the rigid "mind"/"body" dichotomy because perception just is the actualization of the power to be aware of or assimilate the sensible forms of objects. That is, perception is the transformation of a potentially functioning organism into an actually functioning organism, where actually functioning means the taking on of the forms of the sensible objects. The sense works through the organ; it is the power seated in the organ. The sense-organ is the instrument of the sensitive soul. The soul is not located in a particular organ. It is a capacity that is transformed from potential to actual by means of the sense-organs. Analogously, the skill of the painter is not located in his hands, although his skill is actualized by means of his hands.

Ross' point seems to be that Aristotle does not make the distinction sufficiently clear between the taking on of form by a sentient creature and a non-sentient entity. Apparently both can be affected by the
medium. Aristotle's contention is that while the effects may appear to be similar (e.g. the flesh, the plant, and the stone become hot when exposed to fire), the similarity is superficial. Aristotle argues that:

\[\ldots\] plants cannot perceive in spite of their having a portion of soul. in them and obviously being affected by tangible objects themselves; for undoubtedly their temperature can be lowered or raised. The explanation is that they have no mean of contrary qualities, and so no principle in them capable of taking on the forms of sensible objects without their matter, in the case of plants the affectation is an affectation by form and matter together. (424b - 1-4)

Aristotle emphasizes that in the case of non-sentient entities, the affect of becoming qualified by the medium is fundamentally different because the non-sentient patient cannot be affected except by a change which is clearly material. Hence:

Light or darkness, sounds and smells leave bodies quite unaffected; what does effect bodies is not these but the bodies which are their vehicles, e.g. what splits the trunk of a tree is not the sound of the thunder but the air which accompanies thunder. (424b - 10-12)

The objects of sense cannot be realized except by sense. The objects of sense are the consequence of a physical process upon the sensitive organ. The sensing organ is affected by what it sees or hears or tastes
because it is the kind of entity which has the potential to actually apprehend color or sound or flavor. Thus, if sense can only be actual when the organ takes on the forms of the sensible qualities, then, Ross' objection that "the description of the organ as becoming qualified by the form of its object is irrelevant" cannot be sustained. With the modification of the sense organ, the ratio that is the sense becomes actual and sentient. Aristotle can insist then that sense cannot be mistaken that it is sensing. Moreover, Aristotle gives a reductio argument to support the claim that each sense senses that it is sensing:

Since it is through sense that we are aware that we are seeing or hearing, it must be either sight that we are aware of seeing, or by some sense other than sight. But the sense that gives us this new sensation must perceive both sight and its object, viz. color: so that either (1) there will be two senses both perceiver of the same sensible object, or (2) the sense must be perceiver of itself. Further, even if the sense which perceives sight were different from sight, we must either fall into an infinite regress, or we must somehow assume a sense which is aware of itself. If so, we ought to do this in the first case. (425b - 10-16)

In summary then, the ambiguity about the awareness of form that Ross puzzles over dissolves when one abandons a Cartesian conceptual schema. The
organ is not passively bombarded with sense that must subsequently be taken into account or noticed by the mind. Rather, Aristotle claims that the sensitive soul transforms the organ and simultaneously, the organism from a state of potentially being aware of a particular set of sensible qualities into a state of actually being aware of a particular set of sensible qualities. Moreover, it is of the utmost importance to remember than, although the sense-organs do have special objects, the organs are themselves to be conceived of as the instruments of the sensitive soul. It would be a mistake to interpret Aristotle as claiming that the eye is aware of color--the ensouled organism is aware of color by means of the eye (which is colored). Aristotle insists that perception is direct. The sensitive soul actualized its power to receive sensible forms via the instrumentality of organs of sense. It does not, however, become aware of the sensible forms by an inference from the physical state of the sense-organ. Perception of the proper and common sensibles is direct and non-inferential. Again, one must pay particular attention to the claim made by Aristotle that "the faculties of knowledge and sensation are potentially their objects, the one what is knowable, the other what is sensible" (431b - 25-26).
The forms of the particular objects are thus internalized, and this is the initial step in coming to know. I want to suggest that sense-perception should be considered as one end of a cognitive spectrum. At this end of the spectrum, cognition consists simply in an awareness of the sensible forms of the perceived objects. It is the most rudimentary kind of cognitive activity. In the following sections I want to examine Aristotle's account of the various shades of knowledge that comprise this spectrum. Again, the way in which the investigation should proceed is specified by Aristotle:

One begins with the objects of knowledge—i.e. what it is that is knowable or intelligible, then one investigates the processes or way in which one acquires knowledge, and finally one investigates what it is ultimately that enables the rational faculty (or intellect) to function. (415a - 17-22)

I contend that the investigation of the processes through which we acquire knowledge is largely a matter of providing an adequate description of the efficient causes, while the issue of what it is ultimately that enables the intellect to function will be susceptible to an explanation in terms of certain natural teleological principles (e.g. nature does nothing in vain) and final causes.

Thus the first issue to resolve is what is
intelligible. Earlier in this chapter I quoted Aristotle's argument that the faculties of sensation and knowledge take on or "become" the forms of sensible things (in the case of the sensitive soul) and the form of forms (in the case of the rational faculty). (431b - 20 - 432a - 2) What is knowable then are forms of forms. These are to be distinguished from the forms of particular objects apprehended in perception.

Aristotle remarks that "Thinking is different from perceiving and is held to be in part imagination, in part judgement." (427b - 29) Thinking then is comprised of at least two kinds of cognitive activity. One can distinguish imagination from judgment by following Aristotle's own methodological principles--i.e. one ought to first examine the objects of each. My discussion will include a brief examination of the various sensitive faculties. (This discussion is not merely for the sake of completeness, but is also motivated by the medieval adoption and expansion of faculty psychology.) Very roughly, the objects of imagination are various combinations and permutations of the forms taken on in perception. However, while the objects of sense perceptions are incorrigible, the objects of imagination are not ("... sensations are always true, imaginations are for the most part false" (428a - 10). Aristotle gives the
following example of the falsity of imagination:

But what we imagine is sometimes false though our contemporaneous judgement about it is true; e.g. we imagine the sun to be a foot in diameter though we are convinced that it is larger than the inhabited part of the earth . . . (428b - 2-4)

Imagination is thus, strictly speaking, pictorial "image-izing." Imagination cannot occur in an organism that does not possess sense-organs. Aristotle claims that imagining, like perception does occur in animals, although not in all animals. He supposes that it does not occur in grubs, ants, or bees. Consequently, imagination cannot be identical with sense-perception, since these creatures do sense. (428a - 10) Aristotle maintains that imagination often guides the actions of animals. (429a - 4-5) However, he is emphatic that imagination is not a combination of sensation plus opinion or belief, (428a - 25) since he also holds that "in the brutes . . . we often find imagination (but) we never find belief." (428a - 21) This seems, at least on the surface, rather puzzling, since Aristotle does admit that some animals are capable of memory, (980a - 27) and we usually explicate the concept of memory at least partially in terms of beliefs about past events. Moreover, imagination is one component of thinking, and thinking often involves belief-acquisition.
Aristotle's remarks are, perhaps, too quick, but they are not empirically implausible:

And because imaginations remain in the organs of sense and resemble sensations, animals in their actions are largely guided by them, some (i.e. the brutes) because of the non-existence in them of mind, others (i.e. men) because of the temporary eclipse in them of mind by feeling or disease or sleep.

(429a 3-6)

The images or forms that are the objects of imagination were originally generated in sense-perception as images or forms in the sense-organ. They may, however, be distorted and associated in peculiar ways in imagination (e.g. one can imagine a minotaur or centaur by combining various sensible forms).

In the treatise De Memoria et Reminiscentia, Aristotle argues that memory is primarily a function of the sensitive soul because it cannot exist without the forms apprehended in perception:

Accordingly, memory (not merely of sensible, but) even of intellectual objects involves a presentation: hence we may conclude that it belongs to the faculty of intelligence only incidentally, while directly and essentially it belongs to the primary faculty of sense-perception.

(450a - 13-15) 11

Like imagination, memory makes use of the forms originally acquired in sense-perception. In the Posterior Analytics Aristotle discusses how memory
arises out of sense-perception. But though sense-perception is innate in all animals, in some the sense-impression comes to persist, in others it does not. So animals in which this persistence does not come to be have either no knowledge at all outside the act of perceiving, or no knowledge of objects of which no impression persists; animals in which it does come into being have perception and can continue to retain the sense-impression in the soul: and when such persistence is frequently repeated a further distinction arises between those which out of the persistence of such sense-impressions develop a power of systematizing them and those which do not. So out of sense-perception comes to be what we call memory, and out of frequently repeated memories of the same thing develops experience; for a number of memories constitute a single experience.

Memory might then be characterized as a "true" or accurate instance of imagination. Memory (as opposed to imagination) occurs when the soul "becomes" or reproduces in itself a state that conforms to some actual past sequence of sensible forms, without the causal efficacy of sensible objects. Furthermore, although Aristotle denies that animals have genuine beliefs, he maintains that memory does involve the perception of time past.

Hence not only human beings and the beings which possess opinion or intelligence, but also certain other animals possess memory. If memory were a
function of (pure) intellect, it would not have been as it is an attribute of many of the lower animals, but probably, in that case, no mortal beings would have had as the case stands, it is not an attribute of them all, just because all have not the faculty of perceiving time. Whenever one actually remembers having seen or heard, or learned something, he includes in this act (as we have already observed) the consciousness of 'formerly;' and the distinction of 'former' and 'latter' is a distinction in time. (450a - 15-21)

The perception of time or duration is a function of the common sense (sensus communis) which is a faculty of the sensitive soul. Thus the sensitive soul, when remembering, apprehends the forms acquired in perception, but apprehends them as "formerly" rather than "presently."

In order to complete this discussion of the faculties of the sensitive soul (a discussion which is taken up and embellished by Bacon), some mention should be made of the common sense. This is the sense (i.e. power) which organizes and integrates the sensings of each sense. This common sense does not have its own organ. It acts simultaneously with the activity of the special senses. Aristotle’s treatment of the common sense is regrettably quick and cryptic. It is mentioned in De Anima (425a) and De Memoria (450a). The common sense, "the primary faculty of perception" (450a - 10) enables the perciptent to perceive the
common sensibles (movement, rest, figure, magnitude, number, unity) as common to more than one sense (i.e. one is directly aware that one is seeing and feeling one stationary cube). The common sense also accounts for the perception of certain incidental sensibles (e.g. that the white figure is the son of Ariston, that the small white cube one sees is sweet).

It should be noted that Aristotle tacitly includes the common sense as one fundamental aspect of the perceptual experience. I suggest that the failure to discuss the common sense at length (in comparison with the discussions of memory and the imagination) may be an indication of how obvious and unproblematic Aristotle took it to be. One can contrast this with Bacon's treatment of the activity of a cerebrally located common sense as one physiological step in a sequential perceptual process.

Let me summarize the preceding material. Given the satisfaction of certain causal sequences that take place peripheral to the organs of sense (involving standard physical objects and an intervening medium adjacent to the sense-organ), certain sensible forms are present "in" the sense-organ and the soul simultaneously "becomes" these forms. This is sense-perception. When the causal conditions are not satisfied, and yet the soul becomes the sensible forms, the organism
is either imagining or remembering. The sensible forms are the objects involved in perception, imagination, and memory. They provide the basis for induction, for Aristotle states unequivocally that:

\[
\ldots \text{it is consequently impossible to grasp universals except through induction. But induction is impossible for those who have not sense-perception. For it is sense-perception alone which is adequate for grasping the particular. (81b - 5-8)}
\]

The following account of induction must, given the limited scope of this chapter, be cursory. My intent is simply to set the stage for the thirteenth century discussion of what it means to acquire scientific knowledge for:

\[
\ldots \text{out of sense-perception comes to be what we call memory, and out of frequently repeated memories of the same thing develops experience. From experience again--i.e. from the universal now stabilized in its entirety in the soul, the one beside the many which is a single identity within them all--originate the skill of the craftsman and the knowledge of the man of science . . . (100a - 6-9)}
\]

I take it that what occurs in induction is that the soul begins to form simple concepts derived from the sensible forms originally acquired in sense-perception. Induction does not get at essential natures (i.e. formal causes) or final causes: "\ldots induction proves not what the essential of a thing is, but that it has or has not some attribute." (92a - 38)
One can think of induction again in terms of a capacity or function of a certain kind of faculty. This is in part a capacity to be transformed from a potential state of mind to an actual state of mind. Aristotle's famous army in retreat analogy emphasizes this transformation:

\[ \ldots \text{these states of knowledge are neither innate in a determinate form, nor developed from other higher states of knowledge, but from sense-perception. It is like a rout in battle stopped by first one man making a stand and then another, until the original formation has been restored. The soul is so constituted as to be capable of this process.} \ (100a - 9-13) \]

The model suggested by this analogy contrasts sharply with the Platonic theory of recollection where the universal is innate within the soul, although how determinate that universal is, is problematic. On the Aristotelean model, the soul simply has the potential to "become" the universal insofar as the concept becomes actualized in the soul.

The objects of induction are the simple concepts of attributes or particular kinds of things formed in the soul by repeated memories. The objects of scientific knowledge are described as "commensurately universal"—i.e. "the term we apply to what is always and everywhere." (87b - 33) This suggests that, unlike induction,
scientific knowledge does get at essential natures (formal causes) and final causes.

Part of scientific knowledge is knowledge of essential natures (formal causes). The objects of scientific knowledge are essential natures and final causes. Aristotle comments that "the nature of the thing and the reason of the fact are identical," (90a - 15) and again, "to know its essential nature is . . . the same as to know the cause of a thing's existence . . . ." (93a - 4) In order to have scientific knowledge, one must be able to give a fourfold causal account for the subject under investigation. (94a - 20-24)

I have argued previously that the Cartesian mind/body dichotomy should not be read into or out of Aristotle, but, rather, that in De Anima we are confronted with a cognitive spectrum. This spectrum is, it seems, bounded on one end by the perception of sensible forms and is bounded on the other end by knowledge of essential natures and final causes. In the Posterior Analytics Aristotle contrasts the two ends of this spectrum in the following way:

. . . there is a difference between what is prior and better known in the order of being and what is prior and better known to man. I mean that objects nearer to sense are prior and better known to man; objects without qualification prior and better known are those furthest from sense. Now
Thus although knowledge of the objects of sense-perception is temporally prior to and more easily acquired than scientific knowledge, scientific knowledge is more certain (insofar as it is knowledge of necessary connections) and better understood (insofar as it is knowledge "not only of the fact but also the reasoned fact.") (89a - 15)

At this point in the discussion of the latter and of the cognitive spectrum, it is appropriate to introduce Aristotle's concept of the active intellect. In De Anima Aristotle states:

And in fact mind as we have described it is what it is by virtue of becoming all things, while there is another which is what it is by virtue of making all things: this is a sort of positive state like light; for in a sense light makes potential colors into actual colors.

Mind in this sense of it is separable, impassible, unmixed, since it is in its essential nature activity (for always the active is superior to the passive factor, the originating force to the matter which it forms.)

Actual knowledge is identical with its object: in the individual, potential knowledge is in time prior to actual knowledge, but in the universe as a whole it is not prior even in time. Mind is not at one time knowing and at another not. When mind is set
free from its present conditions it appears as just what it is and nothing more: this alone is immortal and eternal (we do not, however, remember its former activity because, while mind in this sense is impassible, mind as passive is destructible), and without it nothing thinks. (430a - 14-25)

At the beginning of this passage, Aristotle distinguishes two kinds of mental activity. The first is the mind's ability to "become all things;" the second is the mind's ability to "mak(e) all things." The abilities of the mind are thus divided into those that are the province of the "passive intellect" (i.e. the former) and those that are the province of the "active intellect" (i.e. the latter).

John Randall, for one, argues that this distinction is aberant and goes against what he takes to be the naturalistic grain of the rest of Aristotelian corpus. He maintains that:

The difficulty is that Aristotle's meaning cannot be found in his words alone. He does not press the point: there is a single concise, very elliptical paragraph. He then goes on in a thoroughly naturalistic vein as before. The 'active intellect' is thus really the least important or significant part of De Anima. To mix the metaphor, it seems to be all that is left in the present text of the De Anima of what had been in his early dialogues a much more important part of Aristotle's youthful Platonism.

(It should be noted parenthetically that Randall's
claim that this distinction is not within the mainstream of Aristotelian epistemology and psychology is particularly interesting since it is this distinction that was so eagerly seized upon by the medieval philosophers in their attempt to reconcile the doctrines of Aristotle with Christian dogma.

In order to secure a foundation for a discussion of Bacon's interpretation of the concept of the active intellect in the Opus Majus, I shall in this last part of this chapter give what I take to be the most plausible reading of this passage that is consistent with the general thrust of Aristotle's thought. I want to suggest that, contra Randall, the distinction between the two aspects of mind can be interpreted in a way that is not only compatible with Aristotle's epistemology and metaphysics, but that this distinction is crucial to an understanding of them.

Let me begin with Aristotle's characterization of the passive intellect. This is the aspect of mind that is capable of "becoming all things." Earlier in De Anima, Aristotle used the famous wax tablet analogy to explain how mind is potentially whatever is thinkable, although actually nothing until it has thought. (429b - 30 - 430a - 5) The intellect is acted upon as in the case of induction. The potential "form of forms"
actually becomes the "form of forms" just as the blank wax tablet becomes an inscribed wax tablet. In this sense, this aspect of mind is not an agent, but becomes what it is through the agency of something else.

This is in sharp contrast with Aristotle's characterization of the active intellect. Aristotle compares the activity of this aspect of mind to the activity of light which transforms potential color into actual color. This analogy deserves close scrutiny. The nature of light and its status as a causal agent is discussed in De Anima. Aristotle's discussion begins with an analysis of color:

Every color has in it the power to set in motion what is actually transparent; that power constitutes its very nature. That is why it is not visible except with the help of light; it is only in light that the color of a thing is seen. (431b 1-3)

Aristotle characterizes light as both an activity and as "the proper color of the transparent:"

Neither air nor water is transparent because it is air or water; they are transparent because each of them has contained in it a certain substance which is the same in both and is also found in the eternal body which constitutes the uppermost shell of the physical Cosmos. Of this substance light is the activity—the activity of what is transparent so far forth as it has in it the determinate power of becoming transparent; where this power is present, there is also potentiality of the contrary, viz. 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;' for fire too contains something which is one and the same with the substance in question. (418b - 7-13)

This means that light transforms the potentially transparent medium (air or water) into an actually transparent medium. Aristotle can be interpreted then as maintaining that light is a condition or state of affairs that characterizes the actualized medium. Moreover, it seems that this characterization is somewhat analogous (at least in form) to the claim that sensing is a state of affairs or condition that characterizes the actualized sensitive soul. Light is not a body nor is it an entity that is produced by some kind of emanation. Aristotle maintains unequivocally that light is a positive state of the transparent:

... light is neither fire nor any kind whatsoever of a body not an efflux from any kind of a body (if it were, it would again itself be a kind of body)--it is the presence of fire or something resembling fire in what is transparent. It is certainly not a body, for two bodies cannot be present in the same place. The opposite of light is darkness; darkness is the absence from what is transparent of the corresponding positive state above characterized; clearly therefore, light is just the presence of that. (418b - 14-19)
Potential color becomes actual color through the agency of light, because light is the state of the medium that enables the potential color to exercise its power and become actual color:

... what is seen in light is always color. That is why without the help of light color remains invisible. Its being color at all means precisely its having in it the power to set in movement what is already actually transparent, and, as we have seen, the actuality of what is transparent is just light. (419a - 8-11)

Hence, light makes the potentially transparent actually transparent. It is not until the medium becomes actually transparent that the potential color can exercise its power, set the medium in motion and become actually colored—i.e. enter into the ratio that constitutes seeing, for "even that which sees is colored." (425b - 23)

Given that the active intellect is the analogue of light, it ought to follow that the active intellect is a state of affairs or a condition of something rather than an entity per se. This state of affairs, if really analogous to light, should be positive and actual. Moreover, this actualized state of affairs must also, like light, be an agent that transforms some other thing from potential to actual.

Aristotle does claim that the active intellect is "in its essential nature activity." (430a - 18)
The apparent difficulty with pressing this analogy much further occurs when one tries to elucidate what it is that the active intellect exercises its causal efficacy upon—i.e. what it is that is analogous to the potential color becoming actual color. Aristotle states that "actual knowledge is identical with its objects." (430a - 20) Although this fits in nicely with the earlier characterization of mind in general as the "form of forms," it is not entirely clear at the outset whether the activity that is the active intellect (the aforementioned condition of having "actual knowledge") is simply the state of affairs that comprises knowing essential natures and final causes, and thus understanding the necessary connections instantiated in the universe, or whether the active intellect encompasses more than the realization of scientific knowledge. I shall argue for an interpretation of the active intellect that supports the latter position.

One can plausibly read Aristotle as claiming that the aspect of mind that we call the active intellect is not subject to contingent constraints of an individual's own particular epistemic history, but is (in some sense yet to be explained in this chapter) absolute and ultimate. One must return to Aristotle's
explicit characterization of knowledge and its objects:

Actual knowledge is identical with its object: in the individual, potential knowledge is in time prior to actual knowledge, but in the universe as a whole it is not prior even in time. Mind is not at one time knowing and at another not. When mind is set free from its present conditions it appears as just what it is and nothing more: this alone is immortal and eternal, . . . and without it nothing thinks. (430a - 20-25)

It is crucial in my interpretation that we take Aristotle at his word, and accept literally his claim that the active intellect is somehow identical with its objects (although I have not yet discussed what those objects are). Unlike the passive intellect, the active intellect is not any potentiality or capacity to become its objects, but is an actuality that has always been actual and identical with its objects. In the preceding passage Aristotle was, I maintain, treating the active intellect as its objects. He was not commenting on any individual mind's capacity to acquire such actual knowledge. The aspect of mind that is called the active intellect is eternal and immortal only insofar as it is identical with its objects; for they, strictly speaking, are what are eternal and immortal. The present limiting conditions that Aristotle refers to are existent rational souls that are at any given time contemplating these eternal objects.
The kinds of objects or entities that are immortal and eternal are, I suggest, concepts of concepts or conceptual frameworks. Such concepts of concepts and conceptual frameworks would include, for example, the Categories, the laws of logic, and mathematical relations. Moreover, for reasons that I will discuss immediately, I want to insist that one has to maintain a distinction between knowledge of these conceptual frameworks, and the sort of scientific knowledge that one has when one accounts for the growth of an acorn into an oak tree by giving the particular material, formal, efficient, and final causes.

In order for the analogy between light and the active intellect to be completely successful, the active intellect must also be not only an actualized condition or positive state of affairs itself, but it must also be the efficient causal agent that enables something else to be transformed from potential to actual. I will now show that this is in fact the case. Just as the lighted medium enables the potential color to become actual color, so too does the active intellect (which, on my interpretation, just is the set of actual concepts of concepts and conceptual frameworks) allow the passive intellect to be transformed from a state of potential scientific knowledge to a state of actual scientific knowledge. That is, if X did not have a
conceptual framework that enabled X to recognize, for example, the difference between what it means to be an essential attribute as opposed to a merely accidental attribute, then scientific knowledge would not be possible. X would at best simply have opinion. The active intellect "makes" it possible for the passive intellect "to become" its objects. On this interpretation then, it would not be possible to have scientific knowledge of particular kinds of things if one did not have a conceptual framework that included some notion of "kinds" (e.g. the Categories). I conclude then that the active intellect does function analogously to light insofar as it "makes" potential scientific knowledge actual. The active intellect is metaphorically the medium of scientific knowledge, for just as particular colors become real via the agency of the lighted medium, so too do particular instances of scientific knowledge become actually known through the agency of actual and eternal conceptual frameworks. Without the active intellect (i.e. actual conceptual frameworks) scientific knowledge would not be possible--i.e. there must be principles and order and kinds instantiated for scientific knowledge, as Aristotle concedes of it, to be possible since scientific knowledge depends on knowing the formal and final, as well as the material and efficient, causes.
Just as in the case of light is necessary for seeing, (again, the fact vs. the reasoned fact) so too, one does not have to know the essential nature of the active intellect in order to realize that science is impossible without metaphysics.

I submit that I am not making the fallacious argument that on the basis of any linguistic or conceptual analysis, that one can simply posit or derive certain sorts of metaphysical entities. Rather, I am claiming that we should interpret Aristotle as maintaining (somewhat, perhaps, like Kant) that there are certain metaphysical modes or ultimate conceptual frameworks of all human minds, and that the crucial defining capacity of a rational being is this ability to use these to know the sciences, and in the best cases, to know these frameworks themselves (knowledge of metaphysics). It is part of the nature of man, his "essential whatness," in principle, to be able to come to know what there ultimately is. These conceptual frameworks make the cosmos intelligible because they embrace the real or actualized metaphysical schemata. The objects that are identical to the active intellect are what there is, and they exist regardless of the existence of men. They are for Aristotle the eternal formal structures of an eternal realizable universe.
Footnotes: Chapter 2


2 The user-tool analogy arises in Aristotle; the emphasis is on the physiological limiting conditions which may restrict the percipient. In Plato and Augustine, the emphasis is rather on the inferior ontological status of the corporeal organ.


5 In "Truth and Error in Aristotle's Theory of Sense Perception," Philosophical Quarterly, 2, No. 42 (Jan. 1961), pp. 1-9, Irving Block makes a similar point in arguing for a "teleological solution" to the infallibility of the perception of the special objects of sense when the sense organ is in a normal condition.

6 It is worth noting that what Aristotle claims is held in common agreement, namely, that nothing exists apart from sensible spatial magnitudes is implicitly an attack on the Platonic theory of forms. Moreover, this tenet of Aristotle's philosophy will be vigorously denied by Muslims and Christians. They will claim that, although God is not a sensible magnitude, He really exists, and, in some sense, can be known.

7 In the second part of this dissertation I shall argue that the way one draws the distinction between a merely sentient creature and a rational one is problematic for Bacon since he must reconcile some seemingly "intelligent" animal behavior with the theological position that reason cannot function in the absence of some kind of divine assistance.


12 The translation used is that of G. R. G. Mure, also in McKeon.


Chapter 3: Augustine on Sense-Perception
And Divine Illumination

I shall begin this chapter with a brief assessment of Augustine's intellectual heritage, and explain in what respects Augustine can be characterized as a Neoplatonist, since he deviates from the Plotinian construction of the hypostases, and, furthermore, identifies God (the Absolute) with Being. I am primarily interested in setting out what I take to be Augustine's efforts to make certain intellectually appealing Neoplatonic theories compatible with Christian dogma.

The consideration of Augustine's Neoplatonism is followed by a general discussion of the nature and function of the soul in his metaphysics and epistemology. Given Augustine's definition of the soul as a rational substance equipped to rule a body, the relationship of the soul to the body is analogous to the relationship of artisan to tool. The discussion of the relationship of the spiritual to the physical develops into a more general treatment of the causal principles operative in the Neoplatonically oriented hierarchical ontology that Augustine espouses. At this point it will be
appropriate to make some preliminary comments on Augustine's claim that all knowledge is a function of the soul. Issues treated in this preliminary discussion will be developed at length in the latter half of this chapter.

The general discussion of the nature and function of the soul leads into a specific examination of Augustine's position with regard to knowledge of sensible objects and his explanation of the nature of sensation. I am particularly concerned with his formulation of, and subsequent solution to, the problems involved in giving an adequate account of perception. I shall show that what Augustine takes to be the fundamental difficulty that a theory of perception must explain is generated by the Neoplatonic causal restrictions that follow from his metaphysics. My explication of Augustine's treatment of sensation and perception concludes with an analysis of Augustine's formulation of the role of memory in recognizing the objects of sense.

Thus the account of the acquisition of the knowledge of sensible things facilitates a more explicit discussion of knowledge that is not acquired via sensation. It is in the last part of this chapter that I provide a critical explication of the doctrine of divine illumination. Divine illumination is explained
by Augustine by analogizing it to the process of vision (an analogy which dominates Thirteenth Century Franciscan thought). Augustine, however, takes vision to be the analogue that most closely approximates the illuminating of the soul (in terms of its formal structure). The Augustinian emphasis on an illuminationist epistemology is crucial for my argument in the second part of this dissertation that Roger Bacon takes the theory of divine illumination, derived from Augustine, as the paradigm of his theory of vision. Thus Bacon's theory of vision must be structurally isomorphic to the theory of divine illumination. I shall argue that structural conformity to what Bacon takes to be Augustine's teaching on divine illumination (an interpretation that reflects Bacon's own Aristotelean proclivities) demands that he allow for some sort of emanation issuing from the seeing eye to secure the parallel.

The metaphysical and epistemological theories of St. Augustine revolve around the core concepts of God and the soul. In order to understand Augustine's discussion of these concepts with respect to the issues of sense-perception and divine illumination, it will be useful to make some preliminary exegetical remarks about what has been called the "Christian Platonism" of St. Augustine.¹
Any assessment of Augustine as heir to and transmitter of the Platonic and Neoplatonic intellectual traditions must take into account the essentially didactic purposes of Augustine's writings. Although it is clear that Platonic and Neoplatonic doctrines influenced both the content and structure of Augustine's philosophy, Augustine's primary intellectual concern was always the elucidation of Christian doctrine and the subsequent understanding of the truths of theology. As a Christian, Augustine was committed to the dogmas agreed upon by the Council of Nicea (325 A.D.). Among the crucial tenets were: the temporal creation of the universe ex nihilo, the triune nature of God, the legitimacy of prophetic revelation, and the final judgment of all souls.

Philosophy was, for Augustine, a tool to aid in the understanding of a body of beliefs accepted as true on the basis of faith, rather than as an instrument useful for the acquisition of true beliefs. Augustine's writings were often precipitated by the immediate needs of his episcopate. He wrote to protect his flock from the evils of particular heretical sects by showing the falsity of the doctrines they espoused, or to settle current theological controversies that threatened the early Church with further schism. Consequently, Augustine did not develop any sort of philosophical program, nor was he a particularly original or innovative
philosopher. In order to support or defend his position with respect to some religious issue, he borrowed freely, though sporadically, from Greek and Roman philosophers, making the theologically necessary modifications and adjustments. Hence the constraints against the development of a rigorous and systematic philosophical program were both practical and theoretical.

Given the limited contexts in which traditional philosophical methods and systems could be (and were) usefully and appropriately employed by Augustine, I want to claim that the philosophical content is most accurately and fruitfully characterized as a form of Christian Neoplatonism. In The Confessions Augustine mentions his reading of Porphory and the Plotinus Enneads, translated and promulgated by Augustine's friend, the ardent Neoplatonist, Victorinus. It is not known how much of the genuine Platonic corpus Augustine actually read; nowhere in The Confessions does he refer to any particular Platonic dialogue (he simply writes of reading "the Platonists:"), whereas he does refer to his reading of The Categories of Aristotle. In The City of God, Augustine refers specifically to Plato's Timaeus and shows a familiarity with the aesthetic and political theories expounded in the Republic. Augustine's own dialogue, The Teacher, indicates that he was aware of the epistemological
problems treated in the *Meno*, and he makes the comment that Aristotle was "in a literary style inferior to Plato." 

More important than the issue of certifying which particular Platonic dialogues Augustine read is the issue of how he read them; it is clear that Augustine interprets Plato as a Neoplatonist.

Augustine is not sensitive to the crucial distinctions between Platonism and Neoplatonism, and Augustine in effect anachronistically includes Plato in the Neoplatonic tradition. Augustine's Neoplatonic rendering of Platonic doctrines will become more obvious below when Augustine's own remarks on the history of philosophy are examined. I shall contend that these considerations make it more appropriate to describe Augustinian philosophy as Neoplatonic rather than Platonic.

A. H. Armstrong's insistence that the term "Platonism" includes the successive stages of Middle Platonism and Neoplatonism, and that this inclusion justifies the further extension of the term as used in the expression "Christian Platonism" to describe Augustine's philosophy is at least heuristically misleading. "Christian Platonism" most usually suggests a philosophical orientation that is principally and
primarily based upon the doctrines formulated and ex­
pounded by Plato. I have claimed (and I shall support
this claim with textual evidence later in this section)
that Augustine without hesitation reads Neoplatonic
ideas into the Platonic corpus. Using Armstrong's
expression "Christian Platonism" to describe Augustine's
philosophy simply adds to the confusion brought about
by Augustine's failure to discern the authentic Platonic
doctrines from the metaphysical and ontological addenda
imported by Plotinus and Porphory. This failure indicates
the extent to which Augustine is himself immersed in
the Neoplatonic conceptual framework. Augustine is not
aware that Platonism and Neoplatonism are two significant­
ly different systems, the former having given rise to
the latter, and he mistakenly lables the Neoplatonic
philosophers "Platonists." In the following passage
from The City of God, Augustine gives his qualified
approval to some features of Neoplatonic philosophy,
all the while referring to the philosophers who pro­
pounded this philosophy as "Platonists."

... I selected the Platonists,
who are deservedly considered
the outstanding philosophers,
first, because they could see
that not even the soul of man,
immortal and rational (or in­
tellectual) as it is, can at­
tain happiness apart from the
light of that God by whom both
itself and the world were made,
and, second, because they hold that the blessed life which all men seek can be found only by him who, in the purity of a chaste love, embraces the one Supreme Good which is the unchangeable God.  

Augustine maintains that the Neoplatonists discovered three truths about God. These truths are the basis, respectively, of natural philosophy, rational philosophy, and moral philosophy.

Perhaps this may be said of the best disciples of Plato--of those who followed most closely and understood most clearly the teachings of a master rightly esteemed above all other pagan philosophers--that they have perceived, at least, these truths about God: that in him is to be found the causes of all being, the reason of all thinking, the rule of all living.  

This passage supports my earlier claim that Augustine's own reading of Plato is thoroughly Neoplatonic. Augustine sees the works of Plotinus and Porphyr as a "fleshing out" of the teachings of Plato. Augustine seems to ascribe to Plato belief in a single ontologically eminent entity. Augustine does not seem to realize that the "One" of Plotinus is not to be found in Plato. Although the theories of Plotinus were generally amenable to a Christian interpretation, there are two issues where the theology of Augustine clearly runs counter to Neoplatonism. The first issue is the characterization of the nature of the ultimate entity:
"The One" or "The Good" of Plotinus and the Christian Trinitarian God; the second issue concerns Augustine's defense of the scriptural account of creation in time of a temporal cosmos, in opposition to the Neoplatonic theory of co-eternal emanation. Augustine is further committed to the doctrine that human souls are created and embodied at the moment of conception. Souls are created, not emanated.

Plotinus posits three distinct hypostases or levels of existence: "The One," Being (Intelligence, Mind), and Soul. He distinguishes The One from Being, maintaining that The One is the primary and supreme principle and that Being is subordinate to it. In the *Enneads*, Plotinus claims that, "It is by The One that all beings are beings," and argues that The One cannot include Being:

...The One is not a being because it is precedent to all being. Being has, you might say, the form of being; The One is without form, even intelligible form.13

Plotinus is claiming that The One is absolute and transcendent. The One is utterly simple and primary, and hence cannot be analyzed in terms of parts and properties. It can only be discussed negatively, insofar as philosophers can say what it is not. "Being" is predictable of kinds of things. It is
in all of the Aristotelean categories. The Plotinian insistence that Being is distinct from and subordinate to The One seems to derive from the rationale that since every kind of entity is a being, then Being somehow includes the notion of multiplicity—a notion that is completely antithetical to the utterly simple One. The One is not a kind at all; it transcends predication:

As the being of each thing consists in multiplicity and The One cannot be multiplicity, The One must differ from Being . . . The One is the first existent. But The Intelligence, the Ideas, and Being are not the first. Every form is multiple and composite, and consequently, something derived because parts precede the composite they constitute . . .

Thus The One is not all things because The Intelligence is all things. It is not Being because Being is all things.14

I take it that Plotinus is arguing that, since there is only one absolute simple entity (The One), every other existent is composite. This line of argument might be defended by invoking the principle of the identity of indiscernables. Being can be constructed metaphorically as the "ontological glue" that holds the composite together. Plotinus suggests that all being is a "being something," i.e. all being is some kind of thing. A kind has certain characteristics or properties qua its being a kind. What holds these properties together

"
in the particular ontological configuration that constitutes a particular kind of thing is being. The following passage elaborates this and also indicates nicely how the principle of vertical causation operates within the hierarchy of the hypostases. In this kind of causation, the effect is always more specific and limited than the cause.

The Intelligence sees that, because it becomes multiple when proceeding from The One, it derives from The One (which is indivisible) all the realities it has, such as life and thought, while The One is not any of these things. The totality of beings must come after The One simply because The One has no determinate form. The One simply is one while The Intelligence is what in the realm of being constitutes the totality of beings. Thus The One is not any of the beings The Intelligence contains but the sole source from which all of them are derived. That is why they are 'beings'; they are already determined, each with its specific form; a being cannot be indeterminate, but only definite and stable. For intelligible beings such stability consists in the determination and form to which they owe their existence.

This passage is particularly interesting because it not only describes the causal subordination of the more determinate to the less determinate, but it also suggests the source for the Augustinian treatment of
potentiality, that is, that there is no pure or undetermined potentiality in any individual thing. Augustine wants to maintain that God's knowledge ranges over the future, as well as the past and the present. This concern motivates Augustine's use of the concept of "seminal reasons" to explain the transformation from potential to actual in material objects, and, more generally to explain the unfolding of the universe in time according to the divine plan.

Etienne Gilson, maintains that Augustine's doctrine of seminal reasons allows for the conservation and stability of the interaction of created things:

In one sense, then, the world was created complete and perfect, since none of the things seen in it escaped the creative act: but in another sense the universe was only created in an unfinished state, because everything that was to appear in it later was created only in germ or seminal reason.

... Seminal reasons, instead of leading to a transformist hypothesis, are constantly called upon by Augustine to account for the stability of species. The elements from which the seminal reasons are made have their own nature and efficacy, and this is the reason why a grain of wheat produces wheat rather than beans, or a man begets a man and not an animal or another species. The seminal reasons are principles of stability.
Augustine also accepts the Neoplatonic thesis that the cause is always superior to the effect generated by it, and, conversely, that the inferior cannot affect what is superior to it. Augustine's acceptance of such vertical causal principles results in his maintaining that sensation is an activity of the soul. Sensation is not physical, nor is it caused, strictly speaking, by physical objects. This account of sensation will be treated in depth in a later section of this chapter; I want now to return to Augustine's reformulation of the Plotinian conception of the hypostases.

Plotinus' characterization of The One as distinct from and superior to Being is unequivocal. There is no easy compromise or conversion for Augustine to make; he must refute a doctrine that claims that the ultimate reality does not have being. Augustine is scripturally committed (Exodus 3:14) to the identification of God with Being. This commitment is clearly seen in a passage from The City of God, in which Augustine attacks the false doctrines of the Manichaeans concerning the nature of God. The argument, however, is also implicitly a refutation of the Neoplatonic position:

The malice of this mistake can be more easily and speedily removed the more clearly one grasps
what God meant by the words 'I am who am . . .'

Since God is supreme being, that is, since He supremely is and, therefore, is immutable, it follows that He gave 'being' to all that He created out of nothing; not, however, absolute being. To some things He gave more of being and to others less and, in this way, arranged an order of natures in a hierarchy of being.

Consequently, no nature—except a non-existential one—can be contrary to the nature which is supreme and which created whatever natures have being. In other words, non-entity stands opposed to God who is the Supreme Being and source of all beings without exception.

Although this passage is ostensibly directed at the Manichaean dualism of equipotent good and evil forces, it reveals a sensitivity on Augustine's part to the arguments of Plotinus. Using the technique of negative predication (which was the Plotinian way of discussing The One), Augustine argues that the antithesis of the highest nature is no nature at all, that is, nothingness. Being cannot derive from nothing. It is only the Absolute Being, the highest nature that can give being to nothingness. To claim that the ultimate entity (The One or the Christian God) does not have being is to violate the principle of vertical causality. God is immutable being and the source of all that is good.
Magnificently and divinely, therefore, our God said to His servant: 'I am that I am,' and 'Thou shalt say to the children of Israel, He who is sent me to you.' [Exodus 3:14] For He truly is because He is unchangeable. For every change makes what was not, to be: therefore He truly is, who is unchangeable; but all other things that were made by Him have received being from Him each in its own measure. To Him who is highest, therefore, nothing can be contrary, save what is not; and consequently as from Him everything that is good has its being, so from Him is everything that by nature exists; since everything that exists by nature is good. Thus every nature is good, and everything good is from God; therefore every nature is from God. 19

Augustine insists that God is immutable and simple. Like Plotinus, he is sensitive to the argument that if something is not simple, it can, in some way, be reduced or dissolved into its composite parts. It would thus be susceptible to change, and not be immutable. That is, if something is not simple, it is a composite; if it is a composite, then it is at least conceptually possible to divide it into its constituent parts. One could conceive of these constituent parts being reconstituted differently: as diminished or augmented or as standing in different relationships to one another. Thus the entity in question would not be immutable, since it could be
other than it is. Augustine wants to maintain that
God is necessarily immutable, that He is the highest
level of being. If God were not immutable, then
there could be a higher level of being than God,
namely an immutable being. (The claim that the
immutable is higher seems to rest on the notion that
all change presupposes an unchanged substratum, and
that what exists \textit{qua} unchanged is prior, not only
temporally, but also ontologically.)

However, given the argument that an immutable
being must be simple, Augustine is confronted with the
difficult task of explaining how the Christian
Trinitarian God fulfills the ontological requirements
of simplicity and immutability. Augustine attempts
to make the doctrine of the Trinity compatible with
the notion of simplicity by giving a technical analysis
of simplicity that runs counter to some common
philosophical and linguistic intuitions:

There is, accordingly, a
good which alone is simple and,
therefore, which alone is unchange-
able--and this is God. This
good has created all goods; but
these are not simple and, there-
fore, they are mutable. They
were created . . . that is they
were made, not begotten. For
what is begotten of the simple
good is likewise simple and is
what the Begetter is. These
two we call the Father and the
Son and, together with their Spirit,
are our God. This Spirit of the
Father and the Son is called in Sacred Scripture, in a very special sense, the Holy Spirit.

Augustine's argument can be summarized in the following way: Since God is the highest level of being, and the source of all being, God is immutable; He cannot be other than He is. Scripture reveals that it is God's nature to be three-personed. God is thus necessarily three-personed; otherwise He would not be what He actually is (i.e. He would be other than He is), and thus would not be immutable. A simple substance is a substance that is what it has. It is the nature of God to have three persons, therefore, God is simple. Recast in the original terms of simplicity (i.e. what is simple cannot be reduced or dissolved into parts), Augustine holds that there are three persons in God, but that God cannot be dissolved or reduced to three discrete persons because no one of those persons is ontologically intelligible without the other two.

It is obvious that the persuasive power of this kind of reasoning depends upon one's willingness to admit premises derived from scriptural revelation in an argument that purports to be philosophical. Augustine does not hesitate in coupling that which is known primarily through scriptural interpretation with that which is known by discursive reasoning. Recognizing
his willingness to conjoin the truths of theology with
the fruits of philosophy is crucial to understanding
his epistemology. Augustine maintains that knowledge
of truths cannot be acquired without divine assistance.
Those secular truths that are considered purely dis-
cursive or conceptual (such as the truths of mathematics),
as well as the revealed truths of theology, can only be
apprehended when the human intellect is divinely
illumined. God is the proximate, as well as the
ultimate, source of human knowledge. Thus, for Augustine,
there is no overwhelming etiological disparity
between premises that are purely theological, and those
that are primarily philosophical.

I shall examine Augustine's formulation of
the doctrine of divine illumination later in this
chapter when I discuss Augustine's epistemology. Before
I can do that, however, it will be necessary to lay out
in detail Augustine's understanding of the nature of
the rational soul.

Although Augustine disagrees with Plotinus on
the origin of the soul (i.e. Augustine maintains that
it is created in time), Augustine takes a markedly
Neoplatonic stance with respect to the nature of the
human soul. He claims that the soul is the level of
being subordinate to the divine, but superior to the
material. In his explication of Genesis, Augustine
describes these three levels of being:

Living, then, in immutable eternity, He has created all things together and from them periods of time flow, places are filled, and the centuries unroll in the temporal and local motions of real things. Among these things, he has established some as spiritual and others as corporeal, giving form to matter that He Himself created without form but capable of being formed—matter which was made by no other being but which did have a Maker. This matter preceded its formation, not in time but in its origin. Now, He set the spiritual creature above the corporeal one, because the spiritual could be moved only through time, while the corporeal was movable through both time and place. For example, the mind is moved through time when it recalls what had been forgotten, or learns what it did not know, or wills what it had rejected—but the body is moved through place, either from earth to sky, from sky to earth, from west to east, or in any other similar way. Now, it is impossible for anything that moves through place to avoid being moved, by the same fact, through time; however, not everything that moves through time must also be moved through place.

So, just as the substance that is moved only through time takes precedence over the substance that is moved through both time and place, so does that substance which is moved neither in place nor in time take precedence even over it. As a result, just as a body moves
through time and place, while
the motion of a created spirit is
only through time—so, He
moves the created spirit through
time but the Creator Spirit moves
neither through time nor through
place. However, the created spirit
moves itself through time and its
body through time and place; while
the Creator Spirit moves Himself
apart from time and place, and
the created spirit through time
apart from place, but body through
time and place. . . . 21

The highest level is that which cannot
be moved either through time or place,
namely, God. The second level is that of soul
or spirit which can only be moved through time. Since
soul is incorporeal, it does not occupy space and
consequently cannot be moved from place to place.
Corporeal things, the lowest level of being, can
be moved in time and in place. Given that God is
immutable and immovable, Augustine takes the degree to
which a being can be moved as an indication of its level
of perfection. A being that is movable in time and/or
place, is thus mutable in time and/or place. The less
mutable a being is, the more perfect it is in the order
of being. This is again an instance of the instantiation
of the principle of vertical causality. The Creator
Spirit is the ultimate causal agent, creating and
sustaining the spiritual and corporeal substances.

The soul is the intermediary between God and
matter. It is a mean between the two ontological extremes, having certain features in common with each. God does not exist in time nor in place. The soul does not exist in place but in time; whereas the body exists both in time and place. And, although God is the supreme causal agent, continuously sustaining His creation by His goodness, the soul can, given divine grace, cause itself to move in time (e.g. to remember the past and to anticipate the future, to learn and thus go from a potentially knowing state to an actually knowing state). Moreover, the soul can direct the corporeal body that is associated with it to move in time and place.

The soul is constantly remembering, understanding, and willing. This is its nature. In order for the soul to move through time (the only mode of existence for an entity at this level of being), it must be engaged in remembering, willing, or understanding. Unlike the "Augustinians" of the thirteenth century, Augustine himself did not apparently conceive of memory, will, and understanding as faculties of the soul. The interpretation of the Augustinian soul as composed of three distinct faculties, each endowed with certain specific powers, occurs when Christian theologians are exposed to the psychological treatises of Aristotle and the Islamic commentators. The noted Augustinian
scholar, Vernon Bourke, describes what he takes to be the authentic position of Augustine in the following paragraph:

Augustine's is not a faculty psychology; there are no distinct operative powers in the Augustinian soul. . . . When Augustine describes the functions of man's soul in terms of memory, understanding, and will (memoria, intelligentia, voluntas), he is not at all thinking of different powers. Rather, . . . the whole soul is memory, the whole soul is intelligence, the whole soul is will. This is a trinitarian psychology in which the diversity of functions of remembering, knowing, and willing does not entail any real difference within the nature of the soul. . . . Augustine pays little attention to the theory of substance and accidents; he takes it that the activities of the soul stem directly from its own nature, without any accidental potencies intervening.22

Augustine's treatment of the three aspects of the soul parallels the triune nature of God in some significant respects. In a passage in his book On the Trinity, Augustine explains the relations that obtain among three aspects of the soul:

Since these three, the memory, the understanding, and the will, are, therefore, not three lives but one life, not three minds but one mind, it follows that they are certainly not three substances, but one substance. . . . these three are one in that they are one life, one mind, one essence. And whatever else they are called in
respect to themselves, they are called together not in the plural but in the singular.

But they are three in that they are mutually referred to each other. And if they were not equal, not only each one to each one, but each one to all, they would certainly not comprehend each other. For not only is each one comprehended by each one, but all are also comprehended by each one.  

Augustine goes on to say that one remembers that he remembers, wills, and understands, just as he understands that he understands, wills, and remembers, and wills that he wills, remembers, and understands. Like the three persons of the Trinity, these three aspects of the soul can stand in different relations with each other without damaging the fundamental unity of the soul.

The parallel between the nature of God and the nature of the soul can be extended a bit further. In his defense of the simplicity of the Triune nature of God, Augustine claimed that something is simple when "it is what it has." The soul is one substance insofar as what it means to be a soul is just to have memory, understanding, and will. At this point, however, the parallel begins to break down. Although the soul is a single substance, it is not immutable. The soul can change back and forth from a state of grace to a state of sin (which is a state of willing to lack
God's grace). Thus the soul is not simple either, since it is not always what it has (i.e. it has the potential to be perfected in the state of grace, but it is not always in that perfect state).

Moreover, the soul of a living person is intimately connected with the corporeal (i.e. the human body). In the dialogue The Magnitude of the Soul, Augustine defines the soul as "a certain kind of substance, sharing in reason, fitted to rule the body." The human body is the tool of the rational soul. This is an idea that is fundamental to the philosophies of both Plato and Plotinus. Body is the instrument which enables the soul to achieve moral perfection, insofar as the soul is judged by God on how it uses or abuses the body (i.e. whether the body is used to execute moral acts or sinful acts). Augustine draws an analogy between the relationship of the soul to the body, and the relationship of master to servant:

For the soul must be ruled by the superior, and rule the inferior. But God alone is superior to it, and only body is inferior to it, if you mean the soul whole and entire. And so as it cannot be entire without the Lord, so it cannot excel without its servant.

The soul is subordinate to God, but the body is subordinate to the soul. The comment that the soul "cannot excel without its servant" is again just the
claim that the function of the soul is to rule the body (thus, trivially, the soul must be embodied), and the soul is ultimately judged by God on whether it used the body to perform moral or immoral acts. The will directs the movement of the body, and, when acting morally, commands it to avoid what is sinful:

And so the will acts by a movement of the body in order that the sense of the body may not be combined with sensible things. 26

In addition to this negative aspect of the soul's dominion over the body, the soul can also use the body to acquire information about the level of being created by God in time and place.

The preceding description of the body as the instrument of the soul provides the basis for Augustine's theory of knowledge and his account of perception and sensation. Prima facie, it seems that if perceptual knowledge is obtained via sensation, then corporeal objects (the bodily organ and/or the object perceived) are the cause of the soul's coming to know the sensible world. This would seem to be a serious violation of the principle of vertical causality, however, since the soul is superior to the body. This is the crux of the Augustinian problem of perception.

In order to understand Augustine's resolution of this problem, it is necessary to indicate the general
parameters of Augustine's epistemology. Augustine wants to maintain that all knowledge is a function of the soul. Memory, will, and understanding constitute the nature of the soul, and it is in virtue of memory, will, and understanding that the soul is equipped to rule the body. Since the soul is the intermediate level of being, it can be acted upon by God, and it can act upon the corporeal level. In the former, the being acted upon by God, divine illumination occurs; in the latter, the acting upon the corporeal, sensation occurs.

Augustine distinguishes thought from belief. According to Augustine, one difference is that thought is prior to belief. To believe is to think with assent. In religious matters, belief follows thought, but precedes and facilitates understanding. Augustine maintains that there are two kinds of objects of knowledge. The first kind of object of knowledge is that which the mind knows by means of the bodily senses as the instruments of the soul. The second kind of object is that which the mind knows through itself (i.e. through memory, will, and understanding) when it is divinely illumined. Knowledge of this latter type derives first from the authority of its source (e.g. Scripture or episcopal decree). Eventually it may be comprehended by the more mature understanding.
Likewise with regard to the acquiring of knowledge, we are of necessity led in a two-fold manner: by authority and by reason. In point of time, authority is first; in the order or reality, reason is prior. What takes precedence in operation is one thing; what is more highly prized as an object of desire is something else.  

Augustine's point is straightforward. A person's "mental history" is usually such that as a child or student he accepts non-sensory or abstract propositions as true before he fully comprehends them or understands why they are true. For Augustine, belief is simply thinking with assent, and, at least in matters of religious doctrine, belief is a prerequisite of understanding, "For believing is one thing and understanding another; and we must first believe whatever great and divine matter we wish to understand."  

Belief is an act of will. This act of will is essentially an act of faith. One must have faith before one is given the grace to understand. Belief is the intermediate epistemic level between ignorance and understanding. True belief is a kind of knowledge, but it is not the same kind of knowledge as understanding. True belief is knowledge that something is the case, understanding is knowing why something is the case.  

At the beginning of this section, the distinction
was made between knowledge obtained by using the senses and knowledge obtained "by the mind through itself."
The acquisition of true belief (i.e. correctly thinking with assent, where the assent is taken as an act of will) is an instance of knowledge acquired by the mind through itself. Again, Augustine is confronted with what appears to be a violation of the principle of vertical causality insofar as the act of will causes the mind to know something superior to itself, namely, truths about the nature of God. Augustine anticipates this objection and explains:

. . . the very will by which we believe is reckoned as a gift of God, because it arises out of the free will which we received at our creation . . . this will is to be ascribed to the divine gift, not merely because it arises from our free will which was created naturally with us; but also because God acts upon us by the incentives of our perceptions, to will and to believe, either externally or by evangelical exhortations, where even the commands of the law also do something, if they so far admonish a man of his infirmity that he betakes himself to the grace that justifies by believing; or internally where no man has in his own control what shall enter into his thoughts although it enters into his own will to consent or dissent.

The ability to will is created and thereby caused by God when the soul is created in the individual.
Although the mind wills to believe the truths of Christian dogma, it would be misleading to say that the soul through its own agency comes to know that which is superior to it. Augustine maintains that God creates a mind that is capable of coming to know eternal truths in the appropriate circumstances. The scriptural or episcopal authority (which is superior to the will) must be present in order for the act of will to result in knowledge. The will is free to embrace either truth or falsity. When it acts without regard for authority, it acquires a false belief. This is, in part, what was at issue in the Pelagian controversy. Pelagius maintained that the will was totally free to choose to be saved or to be damned. Pelagius argued that if the grace of God were necessary for salvation, then the will would be constrained, because it would not be free to choose good over evil except with the aid of divine grace. The presence or absence of divine grace depends, however, not on the human will, but on the will of God. Augustine, on the other hand, claimed that grace was necessary for salvation. He insisted that the soul is totally dependent upon God.

This move is crucial to Augustine's attempt to maintain vertical causality and allow for free will
(i.e. to establish the compatibility of God's absolute and unequivocal creation and conservation of all past, present, and future entities and forces with the doctrine that man can freely choose to reject eternal salvation). Although man cannot apprehend eternal truths entirely through his own agency (since he cannot cause in himself the ideas of things which are ontologically superior), he is free to exercise his will to formulate beliefs. The superior authority is a necessary, but not a sufficient, condition for the acquisition of beliefs about eternal truths. There is no knowledge of the highest level of being that can be acquired independently of the divine assistance. This kind of knowledge requires divine illumination. I shall, however, postpone the discussion of divine illumination until the end of this chapter. The metaphysical and epistemological significance of divine illumination within the Augustinian theological system cannot be fully appreciated unless one understands the cognitive processes that are temporally prior to the contemplation and comprehension of non-sensory entities.

Now that the basic structure of Augustine's theory of knowledge has been outlined, it is appropriate to look closely at his account of sensation and perception. I want to claim that what Augustine took to be the problems involved in giving an account of
perception were generated by his metaphysical commitments, particularly his commitment to the principle of vertical causality. Augustine was clearly not at all within an empiricist tradition, and consequently, his approach to the issue of perceptual knowledge bears little resemblance to contemporary methodology. A. N. Quinton, a fairly representative inheritor of the Angloempiricist traditions currently involved in explicating the philosophy of perception, describes the problem of perception as that of "giv(ing) an account of the relationship of sense-experience to material objects." Augustine is, however, already theoretically committed to positing a certain kind of relationship—a relationship that is fundamentally compatible with the principle of vertical causality—since perception is an activity that involves two ontologically distinct kinds of things (i.e. souls and material objects). Any relationship between two levels of being must conform to the principle of vertical causality; the inferior cannot effect the superior. Therefore, Augustine's focus is the converse of Quinton's. Quinton asks what, given the data, is the relationship? Augustine seems to be asking how can the data be construed, given the relationship? Augustine's problem then is to make plausible an account of perception that explains the relation of sense-experience
to the material object in a way that does not violate the principle of vertical causality.

Augustine's analysis of sensation\textsuperscript{31} is firmly within the Neoplatonic tradition. Although Plotinus does not explicitly formulate a problem of perception as a philosophical issue of great metaphysical import, he does discuss the nature of sensation. Like all Neoplatonists, Plotinus draws the rigid ontological distinction between soul and body. He characterizes the relationship of the soul to the body by using the familiar analogies of the role of a pilot guiding a ship and of a craftsman using a tool. Plotinus maintains that both soul and body are necessary for sensation:

If there are two elements that cooperate in actual sensation, the act of sensing ought to be like the act of boring or weaving. In sensing, the soul is the 'craftsman.' The body is the 'tool.' It is passive and menial. The soul receives the impression produced in the body or by the body as an intermediary, or, perhaps it makes a judgment in accord with the bodily impression. The sensation is accordingly, very much the common achievement of soul and body.\textsuperscript{32}

The tool or instrument is subordinate to the craftsman: it is passive or ineffective until the craftsman puts it to use. The art of the craftsman is manifest, in part, in his skillful use of the tool. Plotinus'
brief treatment is the predecessor of Augustine's analysis.

Augustine argues that since only living things are capable of having sense-experience, sensation must involve the soul. It is obvious that sensation occurs in animals as well as in men, and Augustine allows that animals do have a rudimentary kind of soul which is not rational, but is capable of sensation and locomotion. In the dialogue On the Magnitude of the Soul (an early and somewhat immature work\textsuperscript{33}), Augustine characterizes the cognitive activity that constitutes sense-experience in the following way:

Although sensation and knowledge are different, that 'not being unaware' is common to both, just as animal is common to man and the brute, although they differ very much. For, whatever through the condition of the body or through the purity of the intelligence, of that the soul is not unaware. Sensation claims for itself the first way; knowledge, the other.

... knowledge is not had simply if one is aware of something, but only if that awareness results from an exercise of reason. For if that awareness comes through the body, that is sensation; if the awareness is direct, that is said to be an experience of the body.\textsuperscript{34}
In this passage, Augustine is making the distinction between sensation as an awareness of things by means of the body alone, and knowledge as an awareness of things by means of reason (which is not corporeal). Augustine seems to be claiming here that awareness that is knowledge is characterized by the exercise of reason (which is reflective, and consequently, indirect), whereas the awareness that is sensation is characterized by the immediate apprehension of a change in the condition of the body. (What Augustine means by describing then as "direct awareness" will has to be qualified since he claims that memory is always involved in sensation because it is an act of noting and, consequently, qua act, has duration). What is important about this passage in the context of the preceding discussion is that Augustine seems to be using the traditional (at least since Aristotle) notion of sensation as an occurrent sense-experience, is caused or initiated by a material object effecting some kind of alteration of the corporeal organs of sense which in turn somehow impinge on the conscious soul. Feeling pains and hearing sounds are usually taken as involuntary states of awareness, at least in the cases where one is struck by a solid object or startled by a shout. Hence it appears that the mere physical contact of the body with matter in the environment (e.g. the rock
or the sound waves in the air) causes awareness in the soul. Since the body is ontologically subordinate to the soul, its apparent acting upon the soul (i.e., causing it to become aware of some alteration of the bodily organ of sense) seems to reverse the theoretically dictated causal course.

Augustine responds with considerable philosophical skill to what seems to be a straightforward counterexample to the validity of his claim that all causal activity between the different levels of being is an instantiation of the principle of vertical causality. Augustine does not challenge the description of the interaction between the corporeal organ of sense and the material object. Things existing on the same level of being can act upon or have reciprocal causal interaction with each other. This is horizontal causation. It occurs within a given level of being among ontological peers. There is no difficulty in allowing that the stone causes a change in the condition of the human body when it strikes it.

What is susceptible to analysis and interpretation, Augustine contends, is the nature of sensation. Augustine treats sensation as an activity initiated by the soul, rather than something that the soul passively suffers. Sensation, on Augustine's
interpretation, is an active awareness, a searching by the soul; it is not a passive awareness, not a suffering. The soul is not acted upon by the body. Sensation is cognitive. It is not the alteration of a sense organ, but the awareness the organ is being altered.

In short, it seems to me the soul, when it has sensations in the body, is not affected in any way by it, but it pays more attention to the passions of the body. But this sense, even while we do not sense, being nevertheless in the body, is an instrument of the body directed by the soul for its ordering so the soul may be more prepared to act on the passions of the body with attention to the end of joining like things to like and of repelling what is harmful... But when things affecting the body, you might say with otherness, are applied, it exerts more attentive actions accommodated to certain places and instruments. Then it is said to see or hear or smell or taste or touch. And by such actions it willingly associates proper things and resists improper ones. I think the soul, then, when it senses, produces these actions on the passions of the body, but it does not receive these passions.\textsuperscript{35}

Augustine's analysis of sensation as an activity that the soul engages in as part of the exercise of its function as the master of its body, preserves the principle of vertical causality. Changes in the bodily
organs do not cause the soul to experience that awareness that is sensation, rather, the soul recognizes change in the bodily organs as sensation.

This account of sense-experience is somewhat complicated by what Augustine takes to be the crucial function of memory in acquiring information about the objects of sense-perception. Augustine has maintained that sensation is a "noticing" by the soul. Noticing is an act; all acts have duration, no matter how brief. In order for the soul to acquire sensory knowledge, it must be able to retain what is noticed during the alteration of the organ of sense, so that the soul can begin to understand and judge. Augustine's point is simple: in order to hear a sentence as a sentence, one must be able to remember a string of words; in order to recognize a word as a word, one must be able to remember an ordered collection of syllables; in order to grasp a syllable, one must be able to remember its beginning, its middle, and its end. Everything that has duration can be divided into temporal parts. Memory collects and retains the parts in sequence, consequently, memory is necessary for the awareness that is sensation. In *On Music*, a treatise that deals extensively with issues of sensation and perception, Augustine argues:
For any syllable, no matter how short, since it begins and stops, has its beginning at one time and its ending at another. Then it is stretched over some little interval of time and stretches through its middle to an end. So reason finds spatial as well as temporal intervals have an infinite division and so no syllable's end is heard with its beginning. And so, even in hearing the shortest syllable, unless memory helps us have in the soul that motion made when the beginning sounded, at the very moment when no longer the beginning but the end of the syllable is sounding, then we cannot say that we have heard anything.  

Gilson suggests that since memory is one of the three aspects of the soul, allowing memory to assume such an apparently crucial role in sensation, reinforces Augustine's explication of sensation as a function of the soul:

...memory is involved in the briefest of our sensations. Now since memory is more clearly associated with pure thought than with the elementary sensation of sound produced by the soul, the full contribution of the soul to sense knowledge bursts upon our view: it not only passes judgment on sense knowledge, it creates it.

It would seem, then, that Augustine is claiming that human sense knowledge is propositional (i.e. one is aware that he is hearing, seeing, etc.). Knowledge of sensory
awareness (sensory self-consciousness) is not possible without memory, since such knowledge involves a "judging that." Judging is an act, and thus has duration. Again, anything that has duration consists of temporal parts. These parts are made coherent insofar as memory underscores them. Memory is then a necessary condition for any kind of thought.

Augustine's remark that sensation is characterized by direct awareness can be taken as a causal claim. The soul is the cause of sensation insofar as the soul actively monitors the body. Sensation is the awareness of the changed condition of the body. Nothing intervenes or mediates between the soul and that which it monitors (i.e. the body). Sensation (sensory awareness) necessarily requires the exercise of reason, but the exercise of reason does involve memory. It is now appropriate to examine Augustine's treatment of the rational aspect of the soul.

Augustine was aware of the Meno problem and Plato's subsequent formulation, in the Republic, of the doctrine of reminiscence, as an explanation of the cause of one's knowledge of abstract ideas. Christian dogma, however, included as a basic tenet of faith, the claim that the human soul is created by God ex nihilo. Hence the Platonic solution to the problem
set out in the *Meno* was unacceptable to Augustine since it postulated the reincarnation of souls sequentially in different bodies. Even if the mythic elements of Plato's account are dismissed as heuristic metaphor, the doctrine of reminiscence still requires, contra Christian doctrine, that souls exist prior to and independently of their embodiment. Augustine takes the Platonic account as a starting point, and develops one of the most important doctrines of Christian Neoplatonism, the doctrine of divine illumination.

Therefore, that noble philosopher, Plato, endeavored to persuade that the souls of men had lived here even before they had these bodies; and hence, it is that those things which are learned are rather remembered as known, than known as new things. For, he relates how a certain boy, when asked I know not what about geometry, replied in such a way as if he were most proficient in this branch of learning. For when questioned step by step and skillfully, he saw what was to be seen and spoke of what he had seen.

But if this were a recollecting of things previously known, then certainly everyone, or almost everyone, would be unable to do the same thing if questioned in this manner. For not all have been geometers in their previous life, since there are so few of them in the human race that one can hardly be found. But we ought rather to believe that the nature of the intellectual mind is so formed to see those
things which, according to the disposition of the Creator, are subjoined to intelligible things in the natural order, in a sort of incorporeal light of its own kind, as the eye of the flesh sees things that lie about it in this corporeal light, of which light it is made to be receptive and to which it is adapted.  

Augustine's purported refutation of the Platonic doctrine reveals not only his basic misunderstanding of the theory of reminiscence, but also suggests the extent to which Augustine's interpretation of the fundamental Platonic theories was both derivative and defective. The Neoplatonic emanation/illumination imagery provided the basis for the Augustinian formulation of the doctrine of divine illumination. According to the above passage, divine illumination can only effect a mind that is suited by nature to come to know the incorporeal, intelligible entities. The mind is not an indeterminate tabula rasa, but is created with an ability particular to its own nature to apprehend concepts and truths when it is in the appropriate circumstances. One necessary condition for the apprehension of the intelligibles is the immanent presence of the divine light in the mind whether that presence is acknowledged or not.

Before I examine in detail how it is that the soul can come to know the intelligibles, and particularly
how the soul can come to know truths about the ontologically superior level of being, I want to discuss how it is that the mind can come to know itself, that is, how knowledge is apprehended within the same level of being.

Augustine's concern with respect to knowledge of the soul be the soul is twofold. He wants to claim that the mind can know itself, and, secondly, that one can have knowledge of the nature of other minds. In his early refutation of skepticism, Against the Academicians, Augustine maintains that one can possess knowledge. He attempts to undermine the plausibility of skepticism with respect to sense knowledge by arguing that one's beliefs about how a thing appears to him are incorrigible:

Do not give assent any further than to the extent that you can persuade yourself that it appears true to you, and there is no deception. For I do not see how the Academician can refute him who says: 'I know that this appears white to me, I know that my hearing is delighted with this, I know that this has an agreeable odor, I know that this tastes sweet to me, I know that this feels cold to me.'

Augustine, however, still wants to preserve the traditional Platonic/Neoplatonic distinction between sensory and non-sensory knowledge. It is the purely rational or intellective knowledge of non-corporeal
natures that is of primary importance for Augustine. The objects of rational knowledge can be divided into the soul's knowledge of its own nature, and the soul's knowledge of other intelligible natures and principles. Augustine claims that the mind's knowledge of itself is prior to knowledge of the other intelligible natures:

Or if anyone says that the mind by a general or special knowledge believes that it is such, as he knows from experience that others are, he is speaking in a very foolish manner. For whence does a mind know another mind if it does not know itself? For not as the eye of the body sees other eyes and does not see itself, so does the mind know other minds and does not know itself . . .

But whatever may be the nature of the power by which we see through the eyes, we certainly do not see the power itself, whether it be rays or anything else, with the eyes, but we seek it in the mind; and if it is possible, we also comprehend it in the mind. As the mind itself, therefore, gathers the knowledge of corporeal things through the bodily senses, so it gains the knowledge of incorporeal things through itself, since it is incorporeal.

Augustine is claiming that knowledge of one's own nature is acquired in any successful attempt to acquire knowledge of other natures. This is particularly important because the embodied soul is the intermediate ontological level between pure spirit and matter. Although it is embodied and exists in time,
The soul's coming to know its own spiritual and rational nature is a preliminary step in coming to know the nature of God. The soul must exert itself, perfect itself insofar as it is possible, in order to be worthy of the special illumination that occurs when one begins to understand the divine nature. For just as God's nature is perfect, He does not reveal Himself to a soul that is not as perfectly realized as it can be. The soul that is capable of coming to fully understand its own nature, must actualize this potential, must acquire the most perfect understanding of its own level of being, before it can apprehend truths about the nature of the superior level of being.

The soul's knowledge of itself derives from a kind of introspective analysis. The mind examines how it comes to know corporeal natures; through this examination it recognizes that it has memory, will and understanding. It apprehends memory when it realizes that in order to comprehend what is given in sensation, it must be able to perceive and preserve the constituent parts of a sensation. It recognizes that it has will when it directs the movement of the body. It apprehends that it has understanding when it is able to use language.
The mind apprehends the inferior nature of corporeal things; it apprehends its own nature thus reaching the highest perfection that it can attain as the primary cause of its own knowledge. When it apprehends the nature of God, the mind transcends its own nature; this can only occur through the grace of God.

Augustine discusses the mind's knowledge of lesser natures vis-a-vis knowledge of its own nature in the following passage from The Trinity. It is important to notice that the discussion of the knowledge acquired at different levels of the epistemic hierarchy is couched in terms of the perfection of a nature at a given level.

His knowledge, likewise, is not perfect if it is less than the object known, when this is fully knowable. But if it is greater, then the nature which knows is superior to that which is known, just as the knowledge of the body is greater than the body itself which is known by that knowledge. For knowledge is a kind of life in the understanding of one who knows; but the body is not life . . . But when the mind knows itself, its knowledge does not surpass it, because itself knows and itself is known. When the mind, therefore, knows itself fully and nothing else with itself, then its knowledge is equal to it, because its knowledge is not from another nature when it knows itself. And when it perceives itself fully and nothing more, then its knowledge is neither less nor greater than itself.
Augustine claims that the knowledge of the nature of corporeal objects is more perfect than the corporeal objects themselves, because actual knowledge is not possible without an actually knowing mind. The concept of actualized knowledge entails the existence of an actually knowing mind; mind is ontologically superior to body, so that a concept that involves both the superior and the inferior levels of being (i.e. the concept of actual knowledge of the body) is more perfect than a concept that involves only the inferior level (i.e. the concept of a body). Augustine's position goes further than this however. He claims that not only is the concept of knowledge of the body more perfect than the concept of the body, but that knowledge of the body is more perfect than the body itself. This, of course, fits in nicely with his analysis of sensation: the body cannot be the cause of knowledge of the body, because the knowledge is ontologically superior to it. Hence Augustine's insistence that the power that enables a person to see corporeal objects is ultimately located in the mind, not the eye (which is simply the instrument or tool that the soul uses to exercise its power).  

Moreover, in the passage on the levels of epistemic and ontological perfection, Augustine makes the more controversial claim that a mind that does not
fully understand its own nature is less perfect in that state of potency than the knowledge itself. Only when the mind actually knows its own nature is it equal in perfection to the knowledge of the nature of the mind. I take it that what Augustine means in the passage quoted above is that the knowing mind and the knowledge of the mind are equal in perfection. That is, when the mind is actually knowing, it becomes itself inasmuch as in coming to know itself the mind not only makes use of memory, understanding, and will, but also discovers the functions of each of these and the relationships which obtain between them in virtue of the introspective cognitive process through which it comes to know itself. Since all the functions of the soul are exercised in coming to know itself, the soul becomes fully functionally actualized.

Augustine regards potency as both passive and active. It is passive insofar as it is the subject of action, but it is active because it already has the disposition to realize every form of which it is capable of becoming. Thus, there is no pure potentiality, but only potentiality vis-a-vis some future possible actualization. Returning to the familiar Augustinian analogies, one could argue that, strictly speaking, it is only when a person is engaged in carving that he is actually a sculptor; it is only
when he is instructing his pupils that he is actually a teacher (the rest of the time he is a potential sculptor or a potential teacher). \(^{46}\) One can, given the plausibility of this line of reasoning, argue that only when the mind is remembering, willing, and understanding, is it actually rational (and, therefore, perfectly realized). The perfection is acquired by the mind's examining how it obtains sensory information, and then by further introspection of those mental processes that were postulated in order to account for sensation and perception.

In actualizing its potential to know its own nature, the mind apprehends the inferior and intermediate levels of being. The mind is created by God so that it can apprehend itself through itself. Augustine suggests that the mind "begets" its own knowledge of itself. Knowledge is generated by the union of the mind and the object of knowledge. Knowledge is characterized by Augustine as the offspring of its parents, and, as such, has something in common with, or bears some resemblance to, each parent. \(^{47}\) In the special case of the mind's coming to know itself, the mind is both the knower and the known. The mind unites with itself, and consequently, the offspring of this union will have the same ontological status as
that which produced it. This explains Augustine's claim that the knowing mind and the knowledge of the nature of the mind are equal in perfection.

To begin with, it is, therefore, clear that something can be knowable, that is, it can be the object of knowledge, and yet it may not be known; but is impossible for something to be known, that is not knowable. Therefore, we must obviously hold fast to this principle that everything which we know begets the knowledge of itself within itself at the same time. For knowledge is born from both, from the one who knows and the object that is known. When the mind, therefore, knows itself, it alone is the parent of its own knowledge, for it is itself both the object known and the one that knows. It was, however, knowable to itself, even before it knew itself; but the knowledge of itself was not yet in it, since it had not yet known itself. Hence, when it knows itself, it begets a knowledge of itself, that is equal to itself. For it does not know itself as less than it is, nor is its knowledge that of another essence, not only because it is itself that which knows, but also because it knows itself . . .

The characterization of the mind and the object of knowledge as parents that united to beget knowledge is more than mere metaphor. The mind has the potential to know itself; it is always at least potentially the parent of knowledge. Knowledge is begotten rather than created. Therefore, it is equal to its parent
on the level of being.

Both true belief and understanding are kinds of knowledge. True belief is correctly thinking with assent, and, as such, is an act of will. One chooses to assert that something is the case. Animals are merely sentient; humans exercise reason upon what is given in sensation. Perception is intrinsically judgmental and doxastic according to Augustine. (This is, in part, my interpretation of Augustine as claiming that one acquires incorrigible beliefs about how things appear to oneself in perception.) Hence, this is the weakest kind of knowledge. All knowledge acquired via the senses falls within the alethic category of true belief. Given that minds are embodied, communication between men depends upon the perception of signs by means of the various senses. The mind must apprehend the sign before it can make a judgment concerning the signification of the sign (e.g. one must hear the shout in order to judge that he is being hailed, one must see the picture in order to judge that it is a sketch of a tree). Communication depends upon the perception of sensible signs. At best, perception results in the acquisition of true beliefs, a kind of knowledge that is inferior to understanding (which is certain). Therefore, one cannot acquire certain knowledge
through the use of sensible signs. From this it follows that one can have only true beliefs but not certain knowledge about the contents of other minds.

This conclusion can be given additional support by drawing what I take to be significant parallels between the flexibility of the immediate objects of perception, and the flexibility of the immediate objects of ordinary discursive thought. The actual or immediate objects of perception are constantly changing as the percipient moves about. In Augustine's terminology, the percipient is constantly receiving new species or impressions in sensation as the soul monitors the sense organs. Similarly, the actual thoughts and occurrent beliefs that constitute the immediate objects of consciousness are also constantly changing as the mind shifts its focus of attention. The objects of perception and the objects of ordinary reflective consciousness become actualized as occurrent objects of perception and thought when attention is focused on them. There is, however, an important distinction to be made between the claim that the object of perception qua object of perception becomes an actual/occurre-
rent object of perception when the percipient actually attends to it; and the claim that what it is perceived qua particular kind of entity can undergo change. When Augustine looks at Adeodatus, Adeodatus becomes an
actual object of perception; when Augustine turns away, Adeodatus is not longer an actual or occurrent object of perception, although he is a potential object of perception. Adeodatus *qua* individual man is not at all affected by the change in his status *qua* object of Augustine's perceptions. Adeodatus can change, however; he could become enormously fat and very bald. In this case, what there is that can become an actual/occurrent object of perception has changed. Augustine cannot by simply staring at a bald and fat Adeodatus cause a muscular and curly-haired object of perception to become actual. Adeodatus is, in some sense, still a potential muscular and curly-haired object of perception (he could lose weight and get a wig), but the realization of this potential is outside the causal purview of the percipient (e.g. Augustine) *qua* percipient.

A similar distinction can be made about thoughts and beliefs. When they are considered simply as the objects of consciousness, one can differentiate the thoughts or beliefs as actual or occurrent while they are the immediate objects of consciousness, even though the thought or belief might be about the past or the future. They become actualized thoughts and beliefs, the occurrent objects of consciousness, for the duration
that the mind engages them. What is philosophically
troublesome for Augustine is not so much that the mind
is constantly shifting its attention (although he does
advocate a life of quiet contemplation and asceticism),
but that the particular content of one's beliefs and
thoughts is susceptible to frequent change. Augustine,
like Plato and Plotinus, maintains that an entity
cannot be an object of the highest kind of knowledge,
which is understanding, if it is constantly under­
going change. Augustine wholeheartedly endorses the
Plotinian view that immutability is the criterion of
ultimate perfection. The more susceptible to change a
thing is, the less perfect it becomes. Although the
generic nature of the mind never changes, the particular
contents of the conscious mind are constantly in flux.
The mind is like an eye that constantly shifts its
gaze. And, like the eye, its nature remains the same
even though there is continual diversity in what it sees:

But since the eye of the
mind cannot behold everything
together which the memory re­
tains with a single glance, the
trinities of thought are con­
stantly changing; while some are
coming, others are going, and
so that trinity becomes innum­
erably most numerous.18

The remembered image, the will, and the intellect come
together in thought. The mind comes to know itself as
an entity endowed with a specific nature, distinct from the body, but also to perceive the corporeal level of being by using the body as its instrument. In coming to know itself, the mind begins to have genuine knowledge or understanding, and not just true beliefs. The mind begins to have knowledge of kinds, not simply knowledge of things. We begin to understand a thing as an instance of a kind, having properties essential to its being a that kind of thing.

With the eye of the mind, therefore, we perceive in that eternal truth, from which all temporal things have been made, the form according to which we are, and by which we effect something either in ourselves or in bodies with a true and right reason. The true knowledge of things, thence conceived, we bear with us as a word, and beget by speaking from within; nor does it depart from us by being born.\footnote{1}

Augustine's theory of the relationship of the spoken word to the thing signified serves him as a metaphor for what happens when the mind begins to comprehend essential natures. If one truly understands what a word means, then he not only knows its signification, but also how to use the word appropriately. Likewise, when one understands what it means to say that something has a certain kind of nature, one knows the proper function of things that have a certain kind of
nature. If one fully understands the nature of his own soul, then he knows that he is acting against his own nature if he wills to pursue carnal pleasure since the soul is reasonable. Moreover, when the mind apprehends the intrinsically temporal and, therefore, changeable nature of corporeal things, it knows that it cannot find eternal happiness in the things of the world. If my interpretation of Augustine's position that understanding something necessarily involves knowing the function of that thing, the function of a thing is not a contingent matter, but is tied up with its essential nature and the Augustinian concern for transformation from a state of potentiality to a realized state. The function of the body is to be the instrument of the soul. The body is most perfect vis-a-vis its own nature when it is actively being used by the soul.

Understanding is strikingly different from correct belief. Understanding is not an act of will, although one often performs acts of will prior to understanding. In matters of Christian dogma, faith precedes understanding. Understanding always has metaphysical import, insofar as it is an insight into the nature of things. In accordance with the principles of vertical causality, the mind cannot understand the
natures of ontologically superior entities entirely through its own efforts. In order to acquire knowledge of a higher level of being, the mind must be assisted in coming to know by a superior being.

In a famous passage in The Teacher, Augustine argues that the mind could not be aware of, much less understand, intelligible entities and eternal principles unless God assisted the mind in apprehending them. They exist on a higher level of being than the soul. These natures and principles do not exist in time or place, but they exist as the always actualized reasons within the mind of God. In the appropriate circumstances, these intelligible natures are revealed to the mind by God.

Now, when there is a question of those things which we perceive by the mind—that is, by means of the intellect and by reason—we obviously express in speech the things which we behold immediately in that interior light of truth which effects enlightenment and happiness in the so-called inner man. And at the same time if the one who hears me likewise sees those things with an inner and undivided eye, he knows the matter of which I speak by his own contemplation, not by means of my words, but by the realities made manifest to him by God revealing them to his inner self.32

The theory of divine illumination satisfies the Neoplatonic causal constraints: the superior
affects the inferior. The mind cannot know the superior natures until it is illumined by God. The intelligibles (the "realities") cannot be considered as products of human cognition, although the knowledge that an individual mind actually or occurrently has of the nature of the intelligibles depends, in part, on the receptivity of the individual mind. The ideas of the intelligibles are independent of, but under the appropriate circumstances, accessible to the human mind. Thus, for example, the mind does not create the truths of mathematics, but in the appropriate circumstances, it understands them, and moreover, uses these concepts as standards.

But it is the province of the superior reason to judge of these corporeal things according to incorporeal and eternal reasons, which, if they were not above the human mind, would certainly not be unchangeable; and yet unless something of our own were subjoined to them, we should not be able to employ them as standards by which to judge of corporeal things. But we judge of corporeal things according to the standards of dimensions and figures which, as the mind knows, remain unchangeable.53

The intelligibles are reasons in the mind of God. They are real concepts (eternal natures and principles) actualized in the mind of God. When the mind knows these intelligibles (reasons, concepts, principles), it can use them as absolute standards by
which to judge the degree of perfection in things that exist in time and/or space. Hence, after the mind understands the concept of charity, it can judge which of its own acts are charitable.

The theory of divine illumination develops around two complementary images: the light of God, and the eye of the mind. It is the light of God that allows the eye of the mind to see that which would otherwise be inaccessible to it. Augustine claims that the theory of divine illumination is implicit in the Scriptures; the most striking example is the Gospel of St. John. In The Trinity, Augustine gives a lengthy exegetical treatment of this gospel, and shows how certain phrases directly corroborate particular formal features of his epistemology:

But because of what was said: 'The light shines in the darkness, and the darkness grasped it not,' faith was surely necessary in order that we might believe what we did not see. For by the 'darkness' he meant the hearts of mortals that have been turned away from the light of this kind and are less capable of beholding it.'

Augustine interprets St. John as supporting his own claim that one must believe before one can understand. Only when a person has, by an act of faith, first assented to the truth of Scripture, can he come to understand that truth. Man must become as perfect as he
can through his own efforts before God illumines him so that he comes to understand the implications of that truth. Man must become an actually believing man before he can become an actually knowing man. Faith precedes understanding:

With regard, however, to that supreme, ineffable, incorporeal, and unchangeable nature, which is to be seen in some manner by our understanding, nowhere else does the eye of the human mind exercise itself to better advantage, provided only that it is guided by the rule of faith, than that man himself has in his own nature better than other animals, better even that other parts of his own soul, and that is the mind itself; to it a certain insight into invisible things has been granted, and to it, as to one presiding honorably in a higher and more inward place, the senses of the body also announce all things, in order that it may pass judgment upon them; and there is no one above it except God, to whom it is to be ruled.55

The doctrine of divine illumination plays the crucial epistemic role in Augustine's theology, and his explanation of this transcendental phenomenon is by the analogy to the process of vision. This analogy comes to dominate Thirteenth Century Franciscan thought. Just as one cannot see the corporeal world without physical light, one cannot comprehend the spiritual realm without divine light. The ability to discern metaphysical
truths is activated by the divine light which is always present to the mind. Thus, Augustine opts for a Neoplatonic epistemology—one recognizes the true nature of things by the participation of the divine light in the cognitive processes.
Footnotes: Chapter 3


2 Robert J. O'Connell, St. Augustine's Early Theory of Man (Cambridge, MA, 1968), Chapters I and II.


4 Ibid.

5 Ibid., p. 110.


7 Ibid., p. 162.

8 Armstrong, pp. 3-4.

9 The City of God, p. 186.

10 Ibid., pp. 149-150.

11 One can draw an interesting parallel between Augustine's distorted understanding of the original Platonic doctrines, given his commitment to the Christian dogma and his ready assimilation of certain Neoplatonic metaphysical and epistemological concepts, and what occurred with respect to classical Aristotelianism during the transmission of Greek learning to Western Europe. Thirteenth century philosophers read Aristotle using the Arabic commentaries as exegetical handbooks that supposedly explained in detail what the often terse Aristotle really meant. Thus the medieval understanding of Aristotle was infused with the philosophical views of the Islamic commentators. And these views were developed to accommodate the particular religious and political concerns of Islam.

Augustine's affinity for Neoplatonism is at least partially indicated by the importance Augustine
attaches to preserving as much as he can of the
metaphysical and epistemological structure of Neo-
platonism within the confines of Christian dogma.
Augustine converts Neoplatonism to Christianity.

12 Elmer O'Brien, S.J. trans., and ed., The
13 Ibid., p. 77.
14 Ibid., pp. 75-76.
16 Ibid., p. 99.
17 Etienne Gilson, The Christian Philosophy of
St. Augustine, trans. E. M. Lynch (New York, 1960),
pp. 206-207.
18 The City of God, pp. 246-247.
19 Vernon J. Bourke, The Essential Augustine
(Indianapolis, Indiana, 1974), p. 54.
20 The City of God, p. 217.
21 Bourke, pp. 63-64.
22 Ibid., p. 68.

23 Augustine, The Trinity, trans. Stephen McKenna
in The Fathers of the Church (Washington, D.C., 1963), 45,
311.

John J. Mahon, S.J. in The Fathers of the Church (New
York, 1947), 2, 83.

Taliaferro, in The Fathers of the Church (New York, 1947),
2, 338.
26 The Trinity, p. 336.
27 Bourke, p. 25.
28 Ibid., p. 24.
29 Ibid., p. 22.
The formulation of a fully articulated, comprehensive theory of sense-perception is not to be found in any single work by Augustine. Attempts to resolve the problems inherent in giving an adequate account of sense-perception occur throughout the Augustinian corpus. Augustine’s explanation of the phenomenon of sense-perception was subject to continual modification and revision. Attempts to explicate the nature of sense-perception (an explication that must include both the cognitive processes involved in sense-perception and the epistemic scope of these processes) within the Augustinian corpus usually rise out of or lead into a discussion of Christian dogma. Since Augustine’s theory of sense-perception is developed as the elaboration in writing of such a theory becomes relevant to the understanding of religious doctrine, one must take into account a number of discussions (ranging from the superficial to the profound) of sensation and sense-experience, that are not entirely consistent and congruent. The reconstruction of the authentic Augustinian theory requires attention to not only the chronology of his discussions, but also to the contexts in which these discussions occur. Augustine did not set before himself the task of articulating a theory of sense-experience independent of theology. Thus, my attempt to cull the major texts of Augustine in order to obtain a comprehensive philosophical account of sense-experience is somewhat forced.

33 c. 388 A.D.
34 The Magnitude of the Soul, p. 125.
36 Ibid., VI.8.21, p. 345.
38 F. M. Cornford, The Republic of Plato (Oxford, 1972), Chapter XL.
Augustine's point here seems similar to that made by Descartes in Meditation II, when Descartes concludes that the attempt to discover the nature of the ball of wax (as representative of corporeal natures) has brought more clearly into focus the (incorporeal) nature of his own mind.

This is the position Plato takes in The Theatetus (184b-185e), See, Chapter 1, pp. 18-19.

This concept of potency is another Augustinian doctrine which becomes a basic tenet of Franciscan theology, and figures significantly in the species account formulated by Grosseteste and incorporated in Bacon's Opus Majus. (See, also D. E. Sharpe, Franciscan Philosophy at Oxford in the Thirteenth Century (London, 1930), p. 15.


cf. the use of this metaphor in Theatetus, (156-157).

Ibid. IX.12.18, pp. 287-288.

Ibid. IX.6.9, pp. 278-279.

The Trinity, XI.8.12, p. 333.

Ibid. IX.7.12, p. 281.


The Trinity, XII.2.2, p. 244.
54 The Trinity, XIII.1.2, p. 370.
55 Ibid. XV.27.49, pp. 520-521.
Chapter 4: Robert Grosseteste
and the Philosophy of Light

The influence of Robert Grosseteste (born c. 1170, died 1253) on Roger Bacon has a twofold significance. There is, first of all, the obvious and specific impact of Grosseteste's theory concerning the process of vision on Bacon's theory of perception. Secondly, there is the pervasive effect of Grosseteste's own careful commitment to the role and responsibility of the Christian natural philosopher. In this chapter, I am primarily concerned with delineating the nature of these influences. I shall do this by presenting the four major features of Grosseteste's work that I take to be formative for Bacon. The major features are:

(1) Grosseteste's light metaphysics, (2) the method of composition and resolution, (3) the development of a hierarchical model of scientific explanation, and (4) multiplication of species in visual perception.

Although Grosseteste was not a Franciscan himself, he was the first appointed reader and lecturer to the Franciscans at Oxford. The Franciscans arrived in Oxford in 1224, and the construction of suitable buildings was accomplished by 1230.\footnote{1} Grosseteste

\[ \text{141} \]
lectured to the Franciscans from this time until he became Bishop of Lincoln in 1235. He is generally considered the founder of the scientist/theologian tradition that flourished among Franciscans around Oxford in the thirteenth and fourteenth centuries. While at Oxford, Grosseteste lectured and wrote commentaries on Aristotle's *De Sophisticis Elenchis* and *Analytica Posteriora*. His explication of Aristotle can best be understood in the context of the particular metaphysical and cosmological positions that Grosseteste himself expounded.

Grosseteste did not lecture at Oxford while Bacon studied there. His regular teaching duties were terminated when he assumed the episcopal authority over the very large diocese of Lincoln. It is possible that Bacon became personally acquainted with Grosseteste while Grosseteste was bishop, but it is not certain. It is clear, however, that Bacon had tremendous respect for Grosseteste's scholarly capacities.

Grosseteste is often pointed out as a transitional figure in the history of ideas. His work can be used to mark the beginning of intellectually attentive translation and explication of the Greek and Arabic learning that had been in eclipse in the Christian West. He is challenged by the new knowledge of antiquity. The central concern with light indicates how
firmly Grosseteste stood in the rich traditions of Augustinian theology and how open he was to the burgeoning emphasis on the development of an Aristotelian scientific program. David Lindberg has identified four discernable strains in Grosseteste's discussion concerning light. Lindberg states:

Within Grosseteste's philosophy of light, there are at least four distinct strands, each employing optical analogies and metaphors: (1) the epistemology of light, in which the process of acquiring knowledge of unchanging Platonic forms is considered analogous to corporeal vision through the eye; (2) the metaphysics or cosmogony of light, in which light is regarded as the first product of the self-propagation of a primeval point of light; (3) the etiology or physics of light, according to which all causation in the material world operates on the analogy of the radiation of light; and (4) the theology of light, which employs light metaphors to elucidate theological truths. I do not claim that Grosseteste made explicit such a schema, but it is such that we must employ if we are to understand his achievement and its historical ancestry.4

Lindberg's schema is useful. It not only indicates the diverse aspects of Grosseteste's "philosophy of light,"5 but it also implicitly suggests the utility of certain concepts of light and vision unifying the realms of science and metaphysics. I will emphasize this unifying aspect by showing how the cosmogony of light underlies the physics of light, and how an understanding of what
constitutes a causal explanation in the material realm
in turn leads into a discussion of Grosseteste's epistemology, which is dependent upon his theology.

In "On Light or the Incoming of Forms" (De Luce Seu de Inchoatione Formarum), a work written between 1215 and 1220, Grosseteste begins to develop his systematic cosmogony. I suggest that this work might be viewed in part as an attempt to interpret the account of creation in Genesis according to the Gospel of St. John. In this treatise, Grosseteste maintains that the world was made of primary light (lux) which, characteristically, propagates itself instantaneously and infinitely in straight lines in all directions.

I say that by the infinite plurification of itself equally in every direction light extends matter everywhere equally into the form of a sphere; and it follows of necessity that in this extension the outmost parts of matter are more extended and more rarefied than the inmost parts near the center. And since the outmost parts will have been rarefied to the utmost, the inner parts will still be susceptible of greater rarefaction.

Therefore light in the aforesaid way, extending matter into the form of a sphere and rarefying the outmost parts to the utmost, has in the farthest sphere fulfilled the possibility of matter and has not left matter susceptible of any further impression. And so the first body is perfected in the boundary of the sphere and is called the 'firmament,' having nothing in its composition except first
matter and first form. And accordingly it is the most simple body as regards the parts constituting its essence and greatest quantity, and it does not differ from the genus body except that in it (the most simple body) matter has been fulfilled merely by the first form. But the genus body, which is in this and in other bodies and which has first matter and first form in its essence, abstracts from the fulfillment of matter by the first form and from the diminishing of matter by the first form.

The lux, having achieved perfection of this first form (i.e. complete rarefaction which is the realization of its potential), at the firmament reflects a secondary form of light (lumen) toward the center of the sphere, forming a second sphere of light bounded by the firmament. This second sphere is denser than the absolutely rarefied light of the firmament, yet like the light of the firmament, it is also characterized by an active principle, and thus generates another sphere of yet denser light. The active principle of light not only is the cause of self-multiplication, but also has an ordering function. The sphere is self-organizing so that there is greatest density in the center and greatest rarity toward the circumference. The self-ordering principle continues to serially form the spheres until the Aristotelian cosmos of nine celestial spheres and the sub-lunar realm of the four elements comes into being.
But just as the lumiere [lumen] engendered by the first body has fulfilled the second sphere and within the second lumiere engendered from the second sphere has perfected the 'third sphere' and within the third sphere has left the mass still denser by the assembling. And this assembling which disperses (congregatio disgregans) proceeded in this order, until the 'nine celestial spheres' were fulfilled, and until the most dense mass—which was matter for the four elements, was assembled within the ninth and lowest sphere. But the lowest sphere, which is the sphere of the 'moon,' also engenders lumiere from itself, and by its lumiere it has assembled the mass contained within itself, and by this assembling it has subtilized and dispersed its outmost parts. Nevertheless the power of this lumiere was not so great that by its assembling it dispersed its outmost parts to the utmost. On that account imperfection and the possibility of the reception of assembling and dispersal has remained in every part of this mass. And the highest part of this mass was not dispersed to the upmost but by dispersal was made to be fire, and it still remained matter for the elements. And this element, engendering lumiere from itself and assembling the mass contained within itself, has dispersed its outmost parts, but with a smaller dispersal of the fire itself; and thus it has brought forth 'fire.' But fire, engendering lumiere from itself and assembling the mass contained within, has dispersed its outmost parts, but with a smaller dispersal of itself. And thus it has brought forth air. Air also, engendering from itself a spiritual body or bodily spirit and assembling that which is contained within itself and by this assembling
dispersing its outer parts, has brought forth 'water' and 'earth.' But because more of this assembling virtue than of the dispersing has remained in water, the water together with the earth has remained weighty.

Consequently, the universe is in some significant sense homogeneous. It is not only homogeneous with respect to its formal geometrical structure (i.e. the propagation of light in straight lines), but moreover, the whole composition of all the material in the universe is ultimately reducible to light.

The first bodily form (forma), which some call corporeity, I judge to be light. For light (lux) of itself diffuses itself in every direction, so that a sphere of light as great as you please is engendered instantaneously (subito) from a point of light, unless something opaque stands in the way. But corporeity is that upon which of necessity there follows the extension of matter into three dimensions, although nevertheless each of them, namely corporeity and matter, is a substance which in itself is simple and has no dimensions at all. But it was impossible for form which in itself is simple and without dimensions to bring in everywhere dimensions into matter which is similarly simple and without dimensions, except by plurifying itself and by diffusing itself instantaneously in every direction and, in its diffusion of itself, extending matter, since form cannot abandon matter, because it (form) is not separable, and because matter cannot be emptied of that which of itself has this operation,
namely to plurify itself and to
diffuse itself instantaneously in
every direction. Therefore what-
ever does this work either is
light itself or is a doer of this work
insofar as it participates in light,
which does this of itself. There-
fore corporeity either is light
itself or is the doer of the said
work and the bringer of dimensions
into matter, insofar as it (corporeity)
participates in light itself and
acts through the virtue of the light
itself. But it is impossible for the
first form to bring dimensions into
matter through the virtue of a form
which follows upon it (the first
form). Therefore light is not a
form which follows upon corporeity,
but is corporeity itself.6

The created light (lux) is corporeity which is instantly
and infinitely multiplied until the matter is perfected,
and forms the boundary of the outermost sphere. There
seems to be an Augustinian concept of potency involved
insofar as the light has within itself the capacity for a
particular form of perfection. Light is essentially
characterized by the active principle of generation or
self-multiplication (i.e. it is the very nature of light
to multiply itself until its full potential is realized).

Basic to the metaphysics of light is Grosseteste's
insistence on a hylomorphic ontology (e.g. "light is not
a form which follows upon corporeity, but is corporeity
itself"). Hylomorphism, the universal combination of
form and matter in all created things both spiritual and
material was characteristic of the metaphysics of the
Franciscans at Oxford (and was to be, I shall argue, decisive in Bacon's account of visual species). Matter can be understood as potency, and form as actuality. Aristotle maintained that matter could not be separated from form except in thought (i.e. one can have a concept of prime or uninformd matter). Aristotle allowed that form exists apart from matter in the case of the active intellect: the purely rational is entirely actual and therefore entirely immaterial. The hylomorphism of Grosseteste is not purely Aristotelian, but is imbued with Augustinian notions of causality and emanationism. The non-dimensional simple point of light (lux) has within it the potential to multiply itself three-dimensionally. The cosmology is in keeping with the principle of vertical causality.

Further: men of good sense judge that the first bodily form is more worthy than all the later forms and of a more excellent and noble essence and more like the forms which stand separate. But light is of a more worthy and more noble and more excellent essence than all bodily things; and it is more like the forms which stand separate—and they are the intelligences—than all bodies are. Therefore light is the first bodily form.

Therefore as light, which is the first form created in first matter and which of itself plurifies itself everywhere infinitely and stretches out equally in every direction, could not abandon matter, it drew out matter, along with itself,
into a mass as great as the world-machine (machina mundi) and in the beginning of time extended matter.\textsuperscript{13}

The Oxford philosophers maintained that potency is not indeterminate, but is always regarded as potency to be thus and such (re: Augustine's seminal reasons).\textsuperscript{14} The actuality is the perfection of the individual. The individual comes to be what it always should be. In the metaphysics of light, the light is the first bodily form. The essence of matter is its three-dimensionality, hence light by its self-propagation actualizes that potentiality and makes matter actual. It is the actuality of corporeity, the multi-dimensional actualized, making possible the existence of less perfect entities.

And the form (species) and perfection of all bodies is light (lux): but the light of the higher bodies is more spiritual and simple, while the light of the lower bodies is more bodily and plurified. Nor are all bodies of the same form or species, though they have originated from a simple or plurified light; just as all numbers are not of the same form or species, though nevertheless they are produced by the greater or lesser plurification from unity.\textsuperscript{15}

The cosmology of light enabled Grosseteste to construct an Aristotelian universe ammenable to the Christian doctrine of creation \textit{ex nihilo}. God creates light (lux) which, through its natural activity, generates the cosmos. He is able to account for the distinction
between the celestial and sublunary realms through a combination of emanationist metaphysics and Aristotelian physics. He claims that even though all bodies come from light (lux), the bodies have qualitatively different forms which are hierarchically ranked. The discussion of what Grosseteste means to be substantively an Aristotelian physics is couched in the Platonic terminology of "participation."

But since the lower bodies participate in the form (formam) of the higher bodies, the lower bodies, by its participation in the same form as the higher body, is receptive of movement from the same bodiless motor virtue, by which motor virtue the higher body is moved. Wherefore the bodiless virtue of intelligence or soul, which moves the first and highest sphere by the daily movement, moves all the lower celestial spheres by the same daily movement. But insofar as they are lower, they receive this movement more weakly, because insofar as a sphere is lower, the first and bodily light in it is less pure and more weak. But though the elements do participate in the form of the first heaven, nevertheless they are not moved in a daily movement by the mover of the first heaven. Although they participate in that first light, nevertheless they do not yield to the first motor virtue, since they have that light as impure, weak, and distant from its purity in the first body, and since they have density of matter too, which is the beginning (principium) of resistance and unyieldingness. 16

Grosseteste accepts the Aristotelian view that
the celestial spheres are not susceptible to the
generation and corruption of the four sublunary
spheres. He implicitly accepts the Aristotelian po-
sition that the celestial spheres cannot be corrupted
because there is no motion contrary to celestial cir-
cular motion.\textsuperscript{17} If one takes the universe as a whole
system, corruption of the heavens is impossible. There
could be no natural cause of corruption within the
physical universe. However, Aristotle's doctrine of the
eternity of the universe was incompatible with
scriptural references to creation and an apocalyptic
final judgment.\textsuperscript{18} Grosseteste piously maintained that
Aristotle was correct only insofar as there is no cause
for the corruption of the heavens within the created
universe.\textsuperscript{19} The existence and being of the heavens
(and all the creation) is entirely dependent upon the
will of God, the highest and first form of being. If
God were to cease willing that the universe exist, all
creation would perish instantly. The matter of the
corruption of the celestial spheres can be considered
either from the perspective of the physicist who, since
he cannot \textit{qu\`a} physicist go beyond the sensible data,
can find no intrinsic potential cause for the corruption
of the heavens, or from the broader perspective of the
metaphysician who understands the cosmos as a level of
being dependent upon (or sustained by) a superior level of being. Grosseteste is able to utilize Aristotelian physics just by making clear the limits of its utility in providing only certain kinds of explanations. Augustinian Neoplatonism prevailed, although it did so it seems, by Grosseteste's able use of Aristotelian logic. It is in Aristotle's *Posterior Analytics* that the issue of kinds and levels of explanation in the sciences is discussed.

Grosseteste, and later Bacon, took great care to show how Aristotelian science is complementary to and compatible with Augustinian theology. The cosmogony of light can be given scriptural sanction; the physics of light is discussed in Aristotelian causal terms (except for the vertical component of Neoplatonism), and the metaphysical thrust is clearly Augustinian. Grosseteste's commentary on the *Posterior Analytics* indicates his own acceptance of Aristotelian methodology in yielding scientific knowledge. In order to explain the observed phenomena, one must use the Aristotelian methods of induction and deduction. Grosseteste accepted the Aristotelian theory that in order to know the generic principles of nature, one must first be acquainted with the particular objects of sense. However, he deviated from Aristotle by maintaining the Augustinian doctrine that the abstraction of universals from particulars by
the intellect required the assistance of the divine light,\textsuperscript{20} whereas Aristotle held that it was simply the mind's nature to abstract the universal form from the particulars given in sense. The Aristotelian epistemology thus becomes infused with Augustinian theology.

Before I discuss the role of illumination in Grosseteste's philosophy, I want to set out Grosseteste's utilization of the \textit{Posterior Analytics} in the elaboration of the method of composition and resolution. Grosseteste's formulation is motivated by Aristotle's discussion of definition, in particular the suggestion that one must proceed from a non-causal to a causal definition. Grosseteste remarks in his commentary on the \textit{Posterior Analytics} that:

\begin{quote}
such definitions are assigned, when (Aristotle) assigns defining causes, not because the thing signified may possibly exist nor because the defined thing may be an actuality, but simply so that they may make understood the meaning of the name. And it is always permissible after such a definition to inquire the cause on account of which the thing is, because the definition as such does not give the cause of the thing.\textsuperscript{21}
\end{quote}

Thus in the case of geometrical figures, one can give a non-causal definition of a figure without positing its instantiation in nature (i.e. such figures may not exist except in the intellect). Grosseteste adopts the Aristotelian method of proceeding from the general to
the specific and then from the specific to the general. One begins with the genus (i.e. one expresses what is the most universal and least complex, and then systematically develops what is specific and most complex). This is the method of composition. The method of resolution reverses this procedure.

The method of definition is the method of discovering what the thing under consideration is by means of the definition of that thing insofar as it makes it known. This method involves two procedures, one being by composition and the other by resolution. Aristotle teaches first the method of arriving at the definition by composition, because this method is like a progression from the more universal and simple to the more composite. The method of resolution is the opposite of that. The method of definition by the first way may be treated in a few words as follows. First, one must consider and understand to what genus the thing to be defined belongs. Next the genus should be divided according to its nearest dividing differentiae and one of the two differentiae should be joined to the genus, the differentia, namely, under which the thing to be defined falls. Then the combined genus and differentiae should be divided again according to its nearest differentiae, one of which, as was said above, should be joined with the whole as already divided; and the division must be made in this way further according to the nearest substantial differentiae, of which one should be added to the whole as already divided till the whole aggregate becomes convertible with the thing to be defined, though each of the
parts of that aggregate has a wider application.

The method of definition by the way of composition being known, (he went on) Aristotle teaches how to hunt for the definition by the way of resolution, that is by taking first the more composite things, that is inferiors, and ascending from them by division to the more simple superiors. This method is as follows. One must consider first the things to which the name to be defined applies and take from among those things those which are least differentiated, namely those which are least differentiated according to species and which have the greatest likeness in their accidents. And one must consider what these undifferentiated things have that is common according to the name to be defined. Secondly, one must consider other things which are of the same species as the former but have a greater accidental difference with the first group than the first group have among themselves. And one must consider what is common according to the name to be defined in the second group of things. And thirdly, one must consider what is common according to the name to be defined between the second group of things and the first group. If now everything has been included to which the name to be defined applies, and if they agree in the way described in one common formula (in unam rationem communem) according to the name defined, then that common formula, thus reached by ascending, will be the definition of the name under consideration. 22

In this way, one can begin to ascertain the common nature inherent in the particular manifestations of a phenomena, to draw out the causal relationships between
the phenomenon and its defining attributes. Grosseteste's application of the methodology espoused in the *Posterior Analytics* is an elaboration of Aristotle's inductive and deductive procedures. Grosseteste is not only concerned with clarifying the kinds of information obtained by the use of such procedures, but also with accounting for the differences in the kinds of explanations produced by different sciences treating the same phenomena. The methods of composition and resolution yield not only definitions which contain the common nature of a phenomenon, but may also provide some information indicating how particular instances of a phenomenon may vary. The method of composition enables Grosseteste to go from the simple to the complex, from the general to the particular. The method of resolution is from the particular back to the general. The combination of composition and resolution results in a kind of causal ordering, insofar as one comes to see that the relation of the universal to the particular is ultimately a relation of cause and effect. The particular effects follow from the essential common nature. The method of composition and resolution can be used when one apprehends what kind of thing is to be defined.

Different sciences provide different types of explanation for the same phenomena. Grosseteste readily accepts the distinction made by Aristotle between
having mere knowledge of a fact, and knowing the reason for the fact.\textsuperscript{23} This is, in part, the difference between simply recognizing the usual and apparent antecedents of a phenomenon, and understanding how the effect must necessarily follow from its causes. Grosseteste maintained that explanations in physics or any other natural science could not attain the status of true demonstration because the causes are not necessary. Thus he elaborates a hierarchy of the sciences in which the superior sciences supply the demonstration of intrinsic necessity, whereas the inferior sciences provide extrinsic or apparent fact.

In his Commentary on the Posterior Analytics, Grosseteste explains how a superior science supplements an inferior science: "with such sciences of which one is under the other, the superior science provides the reason (propter quid) for that thing of which the inferior science provides the fact (quia)."\textsuperscript{24} This statement provides some epistemic justification for the claim that the explanation of natural phenomena must conform to the truths of the scriptures. Hence, the superior science, i.e. theology, provides the ultimate reason for the facts described by the inferior natural sciences.\textsuperscript{25} Grosseteste's adaptation and utilization of the Posterior Analytics had far reaching consequences. In Causality and Scientific Explanation, William Wallace
Physics by itself could be science quia, providing knowledge 'of the fact,' but aided by mathematics it could also become science propter quid, yielding knowledge 'of the reasoned fact.' In either event, of course, science must consist in a search for causes through effects, and generally this could be effected by resolving (i.e., by analysis, hence the need of the Analytics) complex phenomena to simple principles, by either a process of definition or a process of demonstration. When principles and causes had been attained, they could then be composed in the order of their production to yield an explanation for the desired effect. Hence the basic method of science was that of resolution and composition. As employed in mathematics and metaphysics, the method yielded perfect accuracy and certitude, but as employed in physics, even with the aid of mathematics--and now a Platonic conviction asserted itself--it could yield only probability. Here a further step became necessary: explanations in physical science had to be checked, they must be subjected to a process of verification and falsification. From this last step was thus born the concepts of experimental science, for experiments, in thought if not in deed, are required to verify and falsify alternative physical explanations. And so Grosseteste and his followers joined experiment (in principle, at least) to mathematics, and in so doing made a firm beginning that was to culminate, four centuries later, in the 'new science' of Galileo. 26

In order to show how one aspect of the general hierarchy of objects of knowledge is constructed,
I want now to examine Grosseteste's discussion of the relationship between optics and geometry. For Grosseteste, "sensible things" are the lowest objects of knowledge, while God is the highest object of knowledge.

The relation of geometry to optics is paradigmatic of the relationship of a superior to an inferior science:

For example, optics falls under geometry, and under optics falls the science concerned with the rays of the sun refracted in a concave watery cloud. It is optics that provides the causes of the rainbow simply speaking, that is according to the condition of radiation which optics appropriates over and above the geometrical subject.27 The superior science (e.g. geometry) provides the reasoned fact for the observed phenomenon (e.g. the behavior of light in specific circumstances). This is why Grosseteste holds that:

... the superior science treats of the causes of the subject which the inferior science receives from it. And so the subordinating science treats of the causes of a conclusion that has been appropriated into the subordinate science, and it does this not in itself but in its universal, for the conclusion of an inferior science is in the superior science only as in its universal. For this reason mathematicians very often know the reason for a conclusion of an inferior science, but they do not
The importance of the laws of geometry as providing a formal explanatory basis for the phenomena involved in the subordinate sciences is clear:

Hence these rules and principles and fundamentals having been given by the power of geometry, the careful observer of natural things can give the causes of all natural effects by this method. And it will be impossible otherwise, as is already clear in respect of the universal, since every natural action is varied in strength and weakness through variation of lines, angles and figures. But in respect of the particular this is even clearer, first in natural action upon matter and later upon the senses, so that the truth of geometry is quite plain.

Since light is the first corporeal form and the first effective principle of "becoming," there is a real connection between the metaphysics of light and the study of the physical properties of light. The metaphysics of light is basic to the physics of light. Light was propagated along straight lines, and it behaves according to geometrical laws. Knowledge of the physics of light can be acquired by the application of the laws of geometry. Hence, physics becomes susceptible to mathematical characterization. Because of this
mathematical element, it becomes possible to obtain some degree of certainty about the natural world insofar as it can be described by the laws of geometrical optics. Grosseteste maintains that the only science capable of pure demonstrative certainty is mathematics. The certifiability of mathematics makes it superior to sciences that are not demonstratively verifiable. Since light always behaves in accord with the laws of geometry, one can give a mathematical account for some aspects of optical phenomena. (One can give a geometrical characterization of the purely perspectival aspect, e.g., dioptrics and catoptrics. If, however, the physiology and psychology of vision are included under optics, the mathematical component becomes more problematic, as I will show when Bacon's work is discussed.)

This rather complex explanatory structure based on a hierarchical conception of the sciences underlies Grosseteste's discussion of perception. Light is the original cause of qualitative change in physical objects, and it is also the necessary causal agent required for visual perception. The behavior of light in the visual process before it enters the eye can be described according to the laws of geometry. The causal efficacy of light is discussed in the following passage from Grosseteste's treatise "Concerning Lines, Angles, and
The usefulness of considering lines, angles, and figures is very great, since it is impossible to understand natural philosophy without them. They are useful in relation to the universe as a whole and its individual parts. They are useful also in connection with related properties, such as rectilinear and circular motion. Indeed, they are useful in relation to activity and receptivity, whether of matter or sense; and if the latter, whether of the sense of vision, where activity and receptivity are apparent, or of the other senses, in the operation of which something must be added to those things that produce vision.

Since we have spoken elsewhere of those things that pertain to the whole universe and its individual parts and of those things that relate to rectilinear and circular motion, we must now consider universal action insofar as it partakes of the nature of sublunary things (inferiorum); this universal action is a subject receptive to diverse activities, insofar as it descends to operation in the matter of the world; and some things can be brought in as intermediaries, which are able to bring to perfection that which is advancing toward greater things (maiora).

Now, all causes of natural effects must be expressed by means of lines, angles, and figures, for otherwise it is impossible to grasp their explanation. This is evident as follows. A natural agent multiplies its power from itself to the recipient, whether it acts on sense or on matter. This power is sometimes called species, sometimes a likeness, and it is the same thing whatever it may be called; and the agent sends the same power into
sense and into matter, or into its own contrary, as heat sends the same thing into the sense of touch and into a cold body. For it does not act by deliberation and choice, and therefore it acts in a single manner whatever it encounters, whether sense or something insensitive, whether something animate or inanimate. But the effects are diversified by the diversity of the recipient, for when this power is received by the senses, it produces an effect that is somehow spiritual and noble; on the other hand, when it is received by matter, it produces a material effect. Thus the sun produces different effects in different recipients by the same power, for it cakes mud and melts ice.

Although light is the ultimate causal agent, species are the proximate causal agents. The effects that the species have upon the recipient depend upon the nature of the recipient—that is, upon the potential of the recipient to become a particular actuality. Species are the efficient causes which transform the recipient from a potential thus-and-so to an actual thus-and-so. The species transforms the sense organ into an actually sensing organ in much the way stated earlier by Aristotle.

Grosseteste stays within the medieval tradition of reading both Plato and Aristotle as advocating at least a partially extramission theory of vision, a version of which he also accepts. Grosseteste's account of vision involves the emission of a substance, the visual
ray or species, from the eye and is closely modeled on the Platonic theory. Lindberg points out that the visual species "is clearly the old visual fire of the Platonic tradition." When the visual species combine with the light of the illuminating body (usually the sun) and encounter an opaque object, vision occurs. Grosseteste allows that the phenomenon of vision may be considered either passively or actively. Those who treat the passive aspects of vision are the "natural philosophers," since they merely describe the apparent process—i.e. that the seeing eye receives visual impression or species of objects in an illuminated environment. It is the mathematicians and physicists who understand the inherently active nature of light, and hence take into account the emission of visual species and extending to the object of sight. Grosseteste claims that an accurate theory of vision must include both the active and passive aspects. Lindberg comments:

Thus Grosseteste appears to have felt that he could reconcile all theories of vision: natural philosophers are correct in maintaining that the eye must receive the forms of visible bodies; mathematicians are correct in speaking of an out-going visual radiation; but Plato has seen that vision is both active and passive and has therefore combined extramission and intromission into a single theory. Grosseteste has in a very primitive way foreshadowed Bacon's later synthesis.
Seeing occurs when the visual ray is emitted from the eye, coalesces with a lighted medium and impinges upon a non-translucent object. The object prevents the visual species from propagating further in that direction. Given that the essential characteristic of the species is instantaneous propagation, the visual ray simply propagates in the reverse direction—i.e. back to the eye. Vision is thus completed. In his **Commentary on the Posterior Analytics**, Grosseteste compares the processes of seeing and hearing, indicating that the propagation of the visual ray is like the propagation of sound through the air by vibrations.

For the visual ray is light passing out from the luminous visual spirit to the obstacle, because vision is not completed solely in the reception of the sensible form without matter, but is completed in the reception just mentioned and in the radiant energy (\textit{radiositate}) going forth from the eye. But the substance of sound is light (\textit{lux}) incorporated in the most subtle air, and when the sounding body is struck violently parts of it are separated from their natural position in the whole sounding body. But a natural power sends the parts passing away from the natural position back to the natural position, and the strength of its return makes it again progress beyond the natural position, and once again it returns to the natural position, and this may
happen several times till the parts are at length quiescent. And so the natural power produces sound by sending back the parts passing out from the natural position when the object has been struck violently and it causes vibrations in them. In the vibrating parts going forth from their natural position there takes place an extension of the longitudinal and compression of the latitudinal diameter, and when they return to the natural position there is in them an alternate constriction and extension of these diameters. And so, when this motion of extension and constriction in the same object, according to the different diameters, reaches the light (naturam lucis) incorporated in the most subtle air which is in the sounding body, sound results. For every natural body has in itself a celestial luminous nature and luminous fire, and the first incorporation of it is in the most subtle air. Hence, when the sounding body is struck and vibrating, a similar vibration and similar motion must take place in the surrounding contiguous air, and this generation progresses in every direction in straight lines. When, however, this generation comes to an obstacle in which the air cannot generate a similar motion in the above-mentioned way, the expanding parts of the air are beaten or driven back on themselves and the vibration and motion in the air are again cast back and generated in the reverse direction, and the sound returns because of the obstacle, as with the visual rays. For, since it cannot generate itself in rectilinear progression, it regenerates itself by turning back. For the expanding parts of the air
colliding with the obstacle must necessarily expand in the reverse direction, and so this repercussion extending to the light which is in the most subtle air is the returning sound, and this is an echo. Therefore, though what in these three cases in substance and truth is the reversal of light, in the rainbow it is the reversal of light because of cloud. An image is the reversal of visual light, that is the reversal of incorporeal light in the way described.36

It is worth noting that Grosseteste claims that sound is carried by vibrations propagated in pulse-like waves. It is possible for the vibrations to be propagated through the medium surrounding the sounding object because both the object and the medium—as natural bodies—have a common nature insofar as each has a "celestial luminous nature and luminous fire."

Crombie makes the further point that:

This passage contains what was perhaps the first attempt to explain the rectilinear propagation of light as a succession of waves or pulses analogous to sound and, taken together with Grosseteste's other applications of mathematical aspects of lux, it foreshadowed in a striking manner a methodological principle on which much of modern mathematical physics, particularly since the seventeenth century, has been based. This is the principle that, in order to be described in the language of science, 'subjective' sensations should be replaced by concepts amenable to mathematical treatment. In his account of vision Grosseteste
distinguished between the sensation produced by 'species' in sentient beings, and the external physical activity which carried the species of light to the eye. This physical activity was independent of 'whatever may meet it, whether something with sense perception or something without it.' It produced sensation in a sentient being simply because the sentient being was of such a nature as to be capable of sensation, and in general its 'effect is diversified according to the nature of the recipient.' The object of mathematical physics was to relate those diversified effects to the mathematical aspects of this physically propagated power.37

Crombie's claim that the methodological principles of seventeenth century science are anticipated by Grosseteste has not received uniform acceptance by other scholars, and the precise relation of both the content and method of medieval science to the modern is still an object of speculation and controversy.38 Grosseteste's endorsement of the mathematical characterization of the non-psychological aspects of vision is significant, and the analogy between light and sound is provocative.

The investigation of the science of optics and the nature of vision leads into consideration of the theological analogues of light and vision. Grosseteste was firmly within the tradition that envisioned science as an instrument for acquiring knowledge of God. The
study of the behavior and nature of corporeal, physical light facilitates the understanding of spiritual light of the divine mind. The Augustinian analogy between the illumination of physical light and the illumination of divine light is thus taken with the utmost seriousness.

He [Aristotle] said therefore that when some sense is lacking some part of knowledge is also lacking . . . Since the senses apprehend singulars, when a particular sense is lacking the apprehension of a particular set of singulars is also lacking, and therefore, since induction is made from singulars, when a particular sense is lacking the induction will be lacking which is taken from the singulars which the missing sense apprehends . . . But I say that it is possible to have some knowledge without the help of the sense. For in the Divine Mind all knowledge exists from eternity, and not only is there in it certain knowledge of universals but also of all singulars . . . Similarly, intelligences receiving irradiation from the primary light see all knowable things, both universals and singulars, in the primary light itself. Moreover, the Divine Mind, in the reflection of Its intelligence upon Itsself, knows the very things which come after Itsself, because it is Itsself their cause. Therefore, those who are without any senses have true knowledge.39

This passage illustrates how Grosseteste utilizes those aspects of Aristotle's theory of knowledge which do not violate Augustinian theology. Thus he argues with Aristotle that each sense has its special
objects, and that it is through the apprehension of the objects of sense that particulars are apprehended. In sentient beings these particulars are the basis for induction. Intelligent beings that lack sense organs (e.g. angels) do not know inductively, but have a more immediate and perfect knowledge of universals and particulars by divine illumination. The Neoplatonic schema of Augustinian theology is clear. Higher levels of being have more immediate and perfect knowledge.

Grosseteste accepts Augustine's doctrine that the nature of the human soul is superior to and potentially separable from the body. Grosseteste argues that:

Similarly, the highest part of the human soul, which is called the intelligence and which is not the act of any body and does not need for its proper operation a corporeal instrument—this intelligence, if it were not obscured and weighed down by the mass of the body, would itself have complete knowledge from the irradiation received from the superior light without the help of sense, just as it will have when the soul is drawn forth from the body, and as perhaps those people have who are free from the love and the imaginings of corporeal things.

But because this purity of the eye of the soul is obscured and weighed down by the corrupt body, all the powers of this rational soul born in man are laid hold of by the mass of the body and cannot act and so in a way are asleep. Accordingly, when in the process of time the senses act through many interactions
of sense with sensible things, the reasoning is awakened mixed with these very sensible things and is borne along in the senses to the sensible things as in a ship.\textsuperscript{40}

In addition to the obvious Neoplatonic imagery in this passage, Grosseteste seems to be advocating something suggestive of the Platonic doctrine of reminiscence. The rational powers are "asleep," and the senses are the instruments which enable the powers of the intellect to become actualized. The sensory experiences are a necessary, but not sufficient condition for the embodied soul's becoming actually rational.

The epistemology now fits in neatly with the metaphysical theology and the hierarchical ordering of the sciences. Those entities that can be best and most perfectly known are those that are closest to the divine. The sensibles given in sensation are necessary, since the soul is embodied and must use experience as a means of coming to know corporeal things. Mathematics, which can be introduced by visual representation, particularly facilitates understanding and brings the mind closer to divine things since the principles of mathematics are unchanging. Again, Grosseteste's position seems to parallel Plato's:

Entities that are prior are nearer to the spiritual light (\textit{luci spirituali}) by whose pouring out intelligible things are made
actually visible to the sight of the mind, and they are more capable of receiving this light and more penetrable by the sight of the mind, and so they are more certain and the science which concerns these is the more certain science. For this reason the science of separate incorporeal substances is more certain than the science of incorporeal substances bound to a body, and this again is more certain than is the science of corporeal substances, just as Aristotle said that the science of the soul is more certain than the other natural sciences which are concerned with changeable natural bodies. Nor does this contradict what was said above, that in mathematics error is rare because mathematical things are plainly visible to the intellect, nor what Ptolemy said, namely that in mathematics knowledge is most certain and more certain than in metaphysics; because we hold that Divine things are more visible to the healthy sight of a mind not obscured by phantasmata, just as the brightest bodies illuminated by the sun are seen better by a healthy bodily eye accustomed to the vision of bright things. But for the infirm mental sight, as our sight is whilst we are weighed down by the weight of a corrupt body and with the appearance of corporeal things, are things wrapped up in phantasmata more visible, just as by the infirm bodily eye dark things casting some shadow are seen better than white things flooded by the full light of the sun. Therefore, for the human intellect as it is now in us, mathematical things are the most certain, because the phantasmata of the imagination received through vision help our understanding; but
for the intellect as it should be in its most perfect state, Divine things are the most certain, and to the extent that things are prior and natures more sublime, so are they more certain.\textsuperscript{41}

It should be noted that Grosseteste's claim that mathematical apprehension is most certain although it can be augmented and assisted by images (phantasmata) acquired through vision, is a claim adopted and elaborated by Bacon. In recognizing the mathematical characterization of the universe through the realization that light acts according to geometrical law, Grosseteste indicates the interface between the changing, created, contingent world, and the unchanging, eternal, incorruptible realm of the divine. The susceptibility of the realm of creation to an ultimately mathematical characterization are traces of the divine.\textsuperscript{42} Just as natural light makes the colored object visible, so too does the light of God make eternal truths apparent. The illuminationist epistemology of Augustinian Neoplatonism thus emerges in Grosseteste. The hierarchy of the sciences is firmly capped by theology.\textsuperscript{43}

2Sharpe, p. 15. A careful delineation of the differences between the scientific/theological orientation of Oxford and the metaphysical/theological orientation of Paris is made in Leff, chapters 4 and 5, pp. 187-309.


5Lindberg argues for this terminology and I shall adopt it here. "There has been much discussion of Grosseteste's 'metaphysics of light' (for which I prefer to substitute the expression 'philosophy of light,' since much of it has nothing to do with metaphysics), but this discussion has frequently suffered from a failure to make several indispensable distinctions among differing bodies of ideas." Ibid.


7Ibid., pp. 259-260.

8Ibid., pp. 254-255.
See, Sharpe, pp. 369-373; Leff, pp. 210, 274; and especially Theodore Crowley's Roger Bacon: The Problem of the Soul in His Philosophical Commentaries (Louvain, 1950), pp. 81-115, for further discussion of hylomorphism.

10 Aristotle, Metaphysics, Book XV, Chapter 3 (1077a and ff).

11 Ibid., Book XII, Chapter 3 (1070a and ff).

12 See, Chapter 3, pp. 86-87.


14 op. cit., Chapter 3, p. 87.


16 Ibid., p. 261.

17 Aristotle, De Caelo, Book I, Chapters 4, 10, 11, and 12.


19 Sharpe, p. 25.

20 Crombie, p. 57.


22 Ibid., pp. 63-64.

23 Aristotle, Posterior Analytics, Book I, Chapter 13 (78a - 20-25).

24 Crombie, p. 92.

25 Grosseteste here seems to anticipate what I take to be the correct interpretation of one aspect of Bacon's epistemology namely that theology provides the final cause for the explanation of natural phenomena. I present an argument for this interpretation when I discuss Bacon's own reading of Aristotle.

27Crombie, p. 92.
28Ibid., p. 93.
29Ibid., p. 110.
31This is discussed in Chapter 2, pp. 40-41.
32The claim that Aristotle maintained an extramission theory of vision seems to be based on some rather cryptic remarks about the visual ray (e.g. De Caelo 290a, De Gen. Anim. 751a). The interpretation of Aristotle's theory of perception as fundamentally intromissionist has been discussed in the first chapter. It is sufficient for my purposes here simply to acknowledge the problem and to point out that both Bacon and Grosseteste believed that Aristotle espoused some kind of an extramission theory. Also, see, David C. Lindberg, Theories of Vision from Al-Kindi to Kepler, pp. 6-9, 113-116.
33See discussion in Chapter 1, p. 12.
35Ibid.
36In, Crombie, pp. 114-115.
37Ibid., pp. 115-116.
38In "The Origins of Modern Science: A New Interpretation" (Diogenes, 1956 pp. 1-22) Alexander Koyre specifically rejects Crombie's claim that the science of the thirteenth century as embodied in the endeavors of Grosseteste can be characterized by a "methodological revolution" which connects the thirteenth century approach to the seventeenth century approach. For more general discussions of the relationships between the medieval and the modern scientific enterprises see E. A. Burtt's The Metaphysical Foundations of Modern Science (Garden City, NY, 1954), William Wallace's Causality and

39 Crombie, pp. 73-74.
40 Ibid., p. 73.
41 Ibid., p. 129.
42 Further discussion can be found in "The Doctrine of Divine Ideas and Illumination in Robert Grosseteste, Bishop of Lincoln" by Lawrence E. Lynch, Medieval Studies, 3 (1941) 161-173.
It is in keeping with the enigmatic character of Roger Bacon that the exact place and time of his birth should be uncertain. It is agreed that Bacon was born during the second half of the first quarter of the thirteenth century in England, and into a family of some wealth. He was educated at Oxford sometime in the 1230's after the period when Grosseteste was engaged in lecturing at the University.

In order to appreciate Bacon's attitude toward learning and his criticism of some of his more celebrated contemporaries, it is helpful to examine what is likely to have been Bacon's own experience, first as a student at Oxford, and then as a young Master of Arts at Paris. Education at Oxford differs from that of the University of Paris in several significant aspects. Paris was the older and more prestigious university of the two, and was continually under the sometimes mixed blessing of close papal protection and scrutiny. The Faculty of Theology at Paris was the most celebrated of such faculties. As such, the content of the curriculum, the books studied, and the questions disputed received an
inevitable publicity. When academic discussion of the recently translated works of Aristotle on natural philosophy and metaphysics involved examining positions that were potentially heretical, public lectures on Aristotle were banned.

At Oxford the study of Aristotle was encouraged by Grosseteste and others. As a student in the Faculty of Arts, Bacon became familiar with Aristotle's natural philosophy. In his course of studies Bacon was probably exposed to the *Physics*, *Metaphysics*, *Categories*, *De Intrepretione*, *Prior and Posterior Analytics*, *Topics*, *Sophistichi Elenchi*, *De Anima*, *De Generatione*, *De Coelo et Mundo*, and *Meterologica*. He did not, it seems, have access at this time to the infamous Secret of Secrets which he later falsely believed to be the key work of and to the Aristotelian corpus.

After Bacon received the Master of Arts degree from Oxford, he joined the Faculty of Arts at Paris. The ban against teaching Aristotle was lifted in the 1240's. Easton has made a persuasive case for understanding Bacon's appointment as a consequence of two factors: (1) since Aristotle had not been publicly taught at Paris, the Paris educated Master of Arts was not as prepared to lecture on Aristotle as an Oxford Scholar, (2) Bacon consistently demonstrated an ability to interpret the natural philosophy of Aristotle in a way that did not
conflict with Christian dogma.\textsuperscript{5} Bacon interpreted Aristotle as allowing for both creation and resurrection claiming that in the \textit{Metaphysics}, there is a final cause argument, and that Aristotle's \textit{Ethics} is based on the premise that happiness comes only after death.\textsuperscript{6}

It is important to note that Bacon's formal training was in the secular discipline of philosophy and although he used philosophy to defend faith, he was not, strictly speaking, a qualified theologian.\textsuperscript{7} The degree of Master of Theology would have required additional years of study. It is not clear how early in his career Bacon was critical of the program of studies for the degree in theology (a program which placed much emphasis on studying the \textit{Sentences} of Peter Lombard). Late in his life Bacon seems to regard professional theologians with special bitterness, seeing them as poorly educated and having an inadequate understanding of the Bible.

Easton sketches a psychological profile of Bacon in which he attempts to reconstruct the personal (largely temperamental) factors which account for Bacon's apparent decision not to acquire a degree in theology. Easton contends that later, Bacon probably regretted this decision because it, in effect, prevented him from being an acknowledged authority on theological
matters, and thus his vituperative attitude toward theologians was largely motivated by envy. Regardless of Bacon's personal prejudices and grievances, his vision of theology was not shared by many of his contemporaries (e.g. Bonaventure), and this difference stems from Bacon's concept of the nature and relation of the sciences.

Although the chronology in Bacon's life is far from certain, it seems that he had ceased teaching at Paris and had returned to England by 1250. Given Bacon's rather arrogant and individualistic temperament, it may seem puzzling at first that he should, in mid-life, join an order that was conspicuously devoted to the principles of poverty, humility, and obedience. However, the probable reasons for Bacon's decision are not difficult to surmise. Oxford was Bacon's alma mater, and the influence of Grosseteste lingered on there. Bacon likely believed that the Oxford Franciscans would be particularly sympathetic to his scientific interest. If so, the order could support his study by making available books and equipment and time to utilize them.

It also should be noted that despite his life-long propensity toward a rather over-generous estimation of himself, Bacon was a deeply religious man. The moral ideals of the Franciscan order are superficially consistent with the moralistic and almost pietistic
outlook which permeates the Opus Majus, although the style and teachings of St. Francis himself could hardly be more different. Finally, Bacon's real or imagined nemesis, Albertus Magnus, was a Dominican. One cannot imagine Bacon entering into an order in which the respect for Albert's intellectual activities were so firmly established.\(^\text{10}\)

After entering the order of St. Francis, Bacon did not receive the enthusiastic support and encouragement of which he believed himself deserving from his fellow friars. Bacon repeatedly lamented the lack of appreciation by his order. This precipitated the once popular characterization of Bacon as a man in advance of his age. The legend that Bacon was a living martyr for the cause of a rigorous and rational science has been duly tempered by modern scholarship.\(^\text{11}\) Bacon's early years as a Franciscan coincided with a period of internal stress and disruption within the order.\(^\text{12}\) There were two opposing interpretations of the mission of the order. The "Conventuals" maintained that the primary duty of the order was to be a tool which could be manipulated by the Pope to facilitate reform and curb clerical abuses. On the other hand, the "Spiritualists" were friars who saw themselves as living exemplar of the holy ideals of St. Francis. Although service to the Pope and following the example of St. Francis were not obviously incompatible
in theory, they were more often than not so in practice. Francis preached humility, strict poverty, and individual cultivation of the spiritual. Zealous followers of the Franciscan regimen tended toward mysticism. There was conflict over the question of how the vow of poverty was to be obeyed. The Conventuals insisted that the vow of poverty applied only to individuals within the order, but not to the order as an institution. The Spiritualists maintained that the order ought not to hold or administer property or money at all. It was the conventualist attitude which ultimately characterized the order, insofar as a succession of Generals of the order recognized the practical necessity of maintaining strong papal affiliation if the order were to remain secure as an order and not simply as a collection of pious individuals.

Bacon's sympathies lay with the Spiritualists in general and with the proponents of the ideas of Joachim of Flora in particular. Joachim flourished at the turn of the century. Various prophecies concerning the imminent coming of the anti-Christ were propounded in a series of works ascribed to him. Although he was not a Franciscan, many in the Spiritualist camp took the Joachite warning to heart. It seems that Bacon was one of them. He cites Joachim's prophecies with approval in the *Opus Majus*. Thus it is not surprising that Bacon's scholarly activities
were regarded with some suspicion by his non-Joachite superiors. The order itself was in a tumult which was becoming a public embarrassment. In 1260 the Minister-General of the order, St. Bonaventure, imposed censorship. The decree of Narbonne required that any work for publication must have the approval of the Minister-General or Provincial Minister. Bacon apparently chafed under the stricter regulations, and he was eventually ordered to the Franciscan convent at Paris, probably for closer supervision.

Despite the climate of suspicion it was in this troublesome decade that Bacon began serious work on the *Opus Majus*. Bacon seems to have initiated the project by sending an emissary to the then Cardinal Guy de Folques indicating Bacon's eagerness to supply him with a major philosophical and scientific work. The Cardinal consented to receive such a work, but only if Bacon acted with a discretion that amounted to complete secrecy. This complication did not deter Bacon. He began work and requested, but did not obtain, funds from his own family in England. In 1265 Guy de Folques became Pope Clement IV. Bacon sent another messenger to remind the new pope of his work in progress. Again, interest in the work was expressed, but the condition of secrecy was maintained.¹⁵

In 1267, Bacon sent the *Opus Majus* to Pope
Clement IV in care of his protege, Brother John. It was a compilation of some of his earlier studies on mathematics and optics, as well as newly prepared treatments on morality and the general state of learning in Christendom. Parts of the book are marred by a hasty and overly polemical style. Bacon intended to persuade the pope of the need for the cultivation of a new kind of critical attitude toward learning. He hoped to gain papal support for his studies that would be less clandestine and more lucrative financially. Although the work was submitted to Clement IV, there is no evidence that he read it before his death in 1268.

Despite the lack of acclaim by the readers at the Papal Court, the *Opus Majus* was and is a significant achievement. It has been clearly demonstrated that Bacon's treatment of optics had seminal influence on the perspectival theories of both Witelo and Pecham. The lack of a less specialized response to the *Opus Majus* may give the misleading impression that it is, after all, a very minor major work. I offer the contrary suggestion, that Bacon's book assumes significance when it is regarded as an unexcelled example of the syncretic genius of the medieval mind. It is a remarkable amalgam of ignorance and learning, naivete and sophistication, worldly fascination and other-worldly aspiration. It is Bacon's vision of the compatibility of science and
religion, the physics of the unbaptized ancients with the metaphysics of the revered church fathers that deserves close examination, and ultimately, appreciation.

The first two parts of the Opus Majus serve not only as an introduction to, but also as a defense of, Bacon's enterprise. In these ("On the Causes of Error" and "On Philosophy"), Bacon attempts to clarify his own position as a Christian and a student of the natural sciences. He argues for the unity of sacred and supposedly profane learning. It is crucial to take seriously these first two parts (they may be seen as remarks directed to his patron Clement IV) in order to fully appreciate his understanding of himself and his work.

The first chapter of the Opus Majus introduces the thrust of the whole work by suggesting what it is not. Bacon begins by indicating what he takes to be "the five chief obstacles in grasping truth."¹⁷ These are: "submission to faulty and unworthy authority, influence of custom, popular prejudice, and a concealment of our own ignorance accompanied by an ostentatious display of our own knowledge."¹⁸ Bacon is, in effect, asking the pope to champion an approach to knowledge which may go against the current of custom and be unpopular. Moreover, since Bacon relies (albeit too heavily and quickly for the modern taste) on authority to buttress
his claims, his admonition against using faulty and unworthy authority gives those authorities he chooses to cite a subtly increased stature.

Bacon's work is an attempt to ameliorate the traditional antagonism between sacred and profane knowledge. Since theology is a working out of revealed truth, it is originally dependent upon what God chooses to reveal in divine illumination. The natural sciences and philosophy have their origins in, and (at least at the outset) depend upon, sensory experience. This distinction had been construed as an absolute dichotomy given: (1) the purported difference in the nature and the content of each kind of knowledge, (2) the alleged certitude that accrued to divinely revealed truths contrasted with the fallible character of perceptual judgments, and (3) the differences in the way in which each kind of knowledge is apprehended.

I shall show that Bacon preserves the distinction between the two kinds of knowledge, but attacks the rigidity of the dichotomy in these following ways. First, he argues that a study of the natural sciences is necessary for understanding the revealed wisdom of the scriptures. Second, he claims that knowledge of the natural sciences is incomplete without revealed wisdom insofar as the causes of natural phenomena cannot be
known in their entirety without some understanding of the divine plan. One cannot acquire either kind of knowledge in its entirety independently of the other kind. Third, Bacon maintains that both kinds of knowledge are constituted by an experiential component. Both involve having an experience, and thus, are in some sense similar kinds of knowledge. He even suggests, without ever showing how, that both types of experience are subject to the principles of experimental science. It is in the analysis of Bacon's discussion of experience that the issue of certitude emerges.

Bacon's own conception of his task as a philosopher-scientist is expounded in his explication and defense of the importance of philosophy with respect to theology. Bacon steadfastly maintains that while theology is the ultimate source of wisdom and truth, the truths of theology cannot be understood by the limited human mind independently of the natural sciences. Thus in the *Opus Majus* Bacon states that "one science is the mistress of the others, namely theology, to which the remaining sciences are vitally necessary, and without which it cannot reach its end,"19 and, moreover, that "there is only one perfect wisdom, which is contained wholly in the Scriptures, and is to be unfolded by law and philosophy."20 The "unfolding" of scripture is
then in part the province of philosophy, especially natural philosophy. This attitude toward the study of natural phenomena as a means of understanding the Word of God was motivated by the premise that the universe is implicitly teleological, and, hence, insofar as the divine will is revealed in the structure of the universe, one can come to know the Creator through His creation. If one studies the book of nature, one can acquire theological insights. This is explicitly the justification given by Bacon for his interest in philosophy and the natural sciences. He insists that "the whole aim of philosophy is that the Creator may be known through knowledge of the creature."\(^\text{21}\) No entity in the cosmos is superfluous or arbitrary. All creation deserves the careful attention of the Christian philosopher-scientist.

Bacon's interpretation of this dictum is complex and requires explication. Bacon maintained that theology is served by canon law and philosophy. He understood canon law as rules deriving from the scriptures since canon law "is acknowledged to give us the way of living according to rule . . . hence this law is nothing else but an explanation of the will of God."\(^\text{22}\) The formulation of canon law involves scriptural exegesis. Bacon claims that such exegesis may require using the knowledge acquired in philosophy since "the whole purpose of
philosophy is to evolve the natures and properties of things." My interpretation of this is that laws are formulated in order to enable man to act in accordance with the higher or better parts of his nature (e.g. rational faculties). Insofar as philosophy and natural science are means by which these faculties are understood, philosophy assists in the formulation of cannon law.

Further, Bacon's remark that "philosophy considered by itself is of no utility," indicates his curiously progressive conservatism. Bacon is progressive insofar as he advocates the careful and methodological study of natural phenomena, but he is conservative insofar as his ends are Augustinian. He seems to be at one with Augustine in valuing only that learning which fosters spiritual development, but then he argues that the study of the creation reflects the Creator and thus the study of the natural sciences is sanctioned.

The following passage is illustrative of Bacon's attempt to justify his own concern with the secular by demonstrating the particular theological usefulness of studying the science of perspective:

For when it is said, 'Guard us, Lord, as the pupil of thine eye,' it is impossible to know God's meaning in this prayer unless one first
considers how the guarding of the eye is affected, so that God deems it right to guard us according to this similitude. For when something is stated as an example and similitude, that which is exemplified cannot be understood unless the meaning of the example is also understood.²⁶

Bacon then points out that the pupil of the eye is guarded by two humors, one web, three coats, and a continuous supply of spirits and forces. Since the spiritual pupil is the soul, then, by analogy, it too requires seven things for its protection, namely, "virtue, gift, beatitude, spiritual sense, fruits, and revelation according to the states of rapture, and in addition the continual influx of grace from the plenitude of the Crucified."²⁷ The analogy can also be interpreted as indicative of the soul's need for the seven virtues and the seven gifts of the Holy Spirit. If one considers the eyelashes as guardians of the pupil, then the guardians correspond to the eight Beatitudes. By including eyelids and eyebrows, the common sense and the imagination, Bacon has inflated the number of guardians to twelve, thus facilitating an analogue to the twelve fruits of the Holy Spirit.²⁸

As an aside it is worth noting another peculiar aspect of Bacon's conception of philosophy and the natural sciences. Bacon believed that there had been a
time when all the secrets of nature were known by the patriarchs and prophets. He claims that these men were divinely inspired to know, for example, "the whole of nature's powers in metals and other minerals." He states that God granted the sons of Seth "a life of six hundred years on account of the glorious parts of philosophy in which they studied, in order that they might know by experience through the length of their life what God revealed to them."

The discussion of the philosophical and scientific knowledge of the patriarchs and prophets arises when Bacon is attempting to defend the legitimacy of such studies currently. He invokes this quasi-mythical age to show that those who were in God's favor received such knowledge and it was useful. Bacon includes Aristotle as one who, despite his exclusion from the chosen people, was given some limited assistance by the Divine. Moreover, he explicitly claims that such knowledge can never be acquired without God's help, "For one could not unaided acquire the principles of the sciences and arts but needed a revelation." Though these claims about the prophet are not central, their import reflects the major concern of Bacon's epistemology: the concern of getting revealed and natural wisdom together and to establish the certainty that attach to each.
Bacon's conception of revealed knowledge and its correlative theology probably came from the rather conservative Augustinian tradition in which he was trained. He accepted the general outlines of Augustine's vertical causality, yet wanted this augmented by the naturalism of Aristotelian science. The explication of the psalm discussed above was a specific application of natural science to revealed wisdom. For the following discussion, the general principles of experimental science and the way in which this science can be applied will be established and elaborated.

The strategy of Bacon's synthesis of the illuminationist aspect of Augustine's epistemology with the empirical tendencies of Aristotle is suggested in the beginning of the part on "Experimental Science:"

. . . I now wish to unfold the principles of experimental science, since without experience nothing can be sufficiently known. For there are two modes of acquiring knowledge, namely, by reasoning and experience. Reasoning draws a conclusion and makes us grant the conclusion, but does not make the conclusion certain, nor does it remove doubt so that the mind may rest on the intuition of truth, unless the mind discovers it by the path of experience; since many have the arguments relating to what can be known, but because they lack experience they neglect the arguments, and neither avoid what is harmful nor follow what is good.32
Bacon's point is that in order to really grasp the truth of the premise in demonstration, one must have experience. One could be convinced of the correctness of the syllogism, but unless one is convinced by experience of the truth of the premise (and both the meaning and subsequently the truth of those that follow), the demonstration will not be convincing. Bacon provides an example to make this claim explicit. One might reason that if fire burns and destroys, then fire ought to be avoided so that burning and destruction may likewise be avoided. Bacon points out that the man who has not had experience of combustion may accept the correctness of the argument, but he will not be convinced that fire burns and destroys. The experience of combustion alone is necessary and sufficient to make the premise and the conclusion certain.\(^3\)

This notion of experience enables Bacon to draw a distinction that allows him to effect a preliminary synthesis of Augustine and Aristotle.

But experience is of two kinds; one is gained through our external senses, and in this way we gain our experience of those things that are in the heavens by instruments made for this purpose, and of those things here below by means attested by our vision. Things that do not belong in our part of the world we know through other scientists who have had experience of them.\ldots This experience is both human and
philosophical, as far as man can act in accordance with the grace given him; but this experience does not suffice him, because it does not give full attestation in regard to things corporeal owing to its difficulty, and does not touch at all on things spiritual. It is necessary, therefore, that the intellect of man should be otherwise aided, and for this reason the holy patriarchs and prophets, who first gave sciences to the world, received illumination within and were not dependent on sense alone. The same is true of many believers since the time of Christ. For the grace of faith illuminates greatly, as also do divine inspirations, not only in things spiritual, but in things corporeal and in the sciences of philosophy; . . . there are two roads by which we arrive at the knowledge of facts, one through the experience of philosophy, the other through divine inspiration, which is far the better way . . . .

Experience then is of two unequal kinds. The first kind of experience is via the senses. (This includes the use of instruments to aid the senses.) It is the experience of the created world and in the province of natural philosophy. This kind of experience does not yield complete knowledge even of corporeal things. (I shall argue that this is because sense never perceives the final cause which, as I read Bacon, is the divine plan. In order for knowledge to be certain, it must be causally complete.) The second kind of experience is that of divine illumination. This kind of experience
is the best and most certain mode of expression. It reveals and by doing so, confirms truths about both the corporeal and spiritual realms. I shall show that for Bacon (and in this he stands as representative of a strong tradition) the most useful (given his Augustinian interpretation of utility) facts about the natural realm concern its relation to the divine.

What Bacon takes to be interesting about the genuinely mundane is that it is an actualization of the divine will. One does not really know all the facts about corporeal phenomena until one knows why God chose to create such phenomena in the way that He did (i.e. to bring it about so that it operates according to certain causal laws). Moreover, as in the previously cited case of the psalmist's use of the pupil as a heuristic device, one occasionally needs the information gained through sensory experience to grasp the full meaning of scripture. This last notion fits in well with the idea discussed with regard to Augustine's Neoplatonism that one must reach as much perfection as one can within the limits of one's own being.35 Man, as a creature capable of learning through sense experience, ought to use that capacity to the fullest.

From the preceding, however, it is not clear how these claims concerning certainty and the two types of
experience (i.e. the one type dealing with the secular
realm of the natural sciences, the other treating
revealed wisdom) relate to what Bacon will go on to say
about the role and nature of mathematics. He asserts
that mathematics is necessary for all knowledge:

There are four great sciences
without which the other sciences
cannot be known nor a knowledge
of things secured. If these are
known, anyone can make glorious
progress in the power of knowledge
without difficulty and labor, not
only in human sciences, but in
that which is divine. . . .
Of these sciences the gate and
key is mathematics.

Knowledge of the science of mathematics is thus necessary
for the other major sciences of optics, experimental
sciences, and moral philosophy. It is through these
four sciences that one acquires both secular and,
ultimately, sacred knowledge

Bacon claims that knowledge of mathematics is
prior to an individual's knowledge of the other sciences.
This is because mathematics is, he maintains, the first
and easiest of all the sciences to grasp, but, more
importantly, it is the foundation of all the other
sciences. The study of mathematics:

. . . prepares the mind and elevates
it to a certain knowledge of all
things, so that if one learns the
roots of knowledge placed about it
and rightly applies them to the
knowledge of the other sciences and
matters, he will then be able to
know all that follows without error and doubt, easily and effectually. For without these neither what precedes nor what follows can be known: whence they perfect what precedes and regulates it, even as the end perfects those things pertaining to it, and they arrange and open the way to what follows. 37

Bacon appears to be making the same sorts of salutary claims with regard to the epistemic import of experience and mathematics insofar as both provide certainty. But it would seem that the certainty of mathematics lies precisely in its demonstrative character, whereas the certainty of experience comes from the having of experience. In the case of experimental knowledge, the certitude is a consequence of the way in which the knowledge was acquired, and thus the certitude is causal. In the case of mathematics the certitude is in the nature of the discipline itself.

This appears to contradict the previously established claim that demonstration does not yield certain knowledge, but rather demonstration depends on experience. This argument claimed that the truth of the premise (and consequently the truth of the conclusion) must be certified by experience. Bacon seems now to be claiming that demonstration in mathematics is the key to certitude in the other sciences. I shall explain how these claims are to be understood and subsequently
reconciled.

The resolution to this *prima facie* contradiction lies in the necessity which Bacon attributes to mathematical premises. Bacon claims that in mathematics "Demonstration causes the truth to be known." This is because in mathematics the "proper and necessary causes can be given." This is much like and may derive from the position of Grosseteste. Bacon contrasts this with the less convincing demonstration in the other sciences where there is no necessity, strictly speaking, since the causes as well as the effects of natural phenomena are susceptible to generation and corruption. Necessity is understood as that which is not contingent or accidental. Demonstration which treats contingent truths is always hypothetical or speculative and must be confirmed by experience.

For example, Bacon holds that metaphysical claims are established by experience of natural phenomena. In this he takes himself to be following Aristotle. He writes: "In metaphysics there can be no demonstration except through effect, since spiritual facts are discovered through corporeal effects and the Creator through the creature . . ." Metaphysics here seems to mean both Aristotelian natural metaphysics and Baconian theology. Both require sense experience for their acquisition
in normal cases. Mathematics, by contrast, utilizes premises whose necessity can be grasped without experience. The mind immediately intuits their truth.

Mathematical demonstration may be accompanied and somewhat enhanced by the use of illustrations and diagrams. This would provide an experiential element to mathematics. Bacon states:

"... in this subject [i.e. mathematics] it is possible to have for all things an example that may be perceived by the senses and a test perceptible to the senses in drawing figures and in counting, so that all may be clear to the sense. For this reason there can be no doubt in this science."

These mathematical experiences serve to remove doubt and thus effect psychological certainty, but they are not properly part of the subject matter per se. They are useful for learning mathematics, not necessary.

This view concerning the necessity of mathematics is further complicated when one realizes that Bacon holds that mathematics is fundamental to perception. Perception always involves the apprehension of quantity. Since mathematics is construed as the science of quantity, mathematics forms the basis of the science of perception. In this rather strained sense, experimental science depends on perception. There are also other ways in which mathematics is involved in experimental science.
For example, Bacon holds that experimental science utilizes mathematics in providing an accurate description of natural phenomena.

The Opus Majus is then an attempt to produce a coherent synthesis of the principles of science and theology, and this is particularly evident in Bacon's treatment of vision. Like his predecessor, Grosseteste, Bacon also opts for an extramission theory of vision. He accepts and elaborates the theory of species employed by Grosseteste. Bacon's treatment of optics is, however, much more thorough than Grosseteste's. This is in part because Bacon is able to make use of the newly translated works of Alhazen (which had not been available to Grosseteste).

In addition to the Optics of Alhazen, Bacon uses Aristotle's De Anima and Avicenna's commentary on it as the primary sources for his explanation of the processes involved in perception. Bacon's discussion of "Optical Science" in the Opus Majus includes an extensive treatment of psychology of perception, a treatise on the anatomy and physiology of the eye, and a text on the geometry of reflection and refraction.

Although Aristotle was Bacon's primary source and influence for the discussion of perceptual cognition, Bacon's reading of Aristotle was somewhat skewed. Bacon
firmly and falsely believed in the Aristotelian authorship of the spurious *Secret of Secrets*. He alludes to that work in justifying his own enterprise, insofar as he maintains the intrinsic unity of wisdom and the sciences. A more serious qualification is that Bacon, like many of his contemporaries, reads Aristotle (as though it were) through the spectacles of the Islamic commentators. Given the Neoplatonic cast of much Islamic philosophy and Bacon's own Augustinian proclivities, the Islamic commentaries were read as a clarification of Aristotle's intent rather than as an adaptive interpretation. Bacon uses Avicenna to interpret Aristotle with regard to the faculties involved in perception and the role of the active intellect. Avicenna's own Neoplatonic interpretation of Aristotle encourages Bacon's occasional skepticism about the accuracy of the Aristotelian texts that are not readily susceptible to such a reading.

In brief, Bacon's theory of vision involves the multiplication of species or forms from both the visible object and the seeing eye. I shall argue that his interpretation of species follows along the lines of an Augustinian causal theory. The psychology of visual cognition is largely that of Aristotle and Avicenna; and the optical geometry is derived from Alhazen. I shall reconstruct the theory of vision emphasizing Bacon's
attempt to integrate the Augustinian and Aristotelian elements. Bacon's task is, in short, to utilize Aristotle's enormously attractive account of visual experience within the conceptual framework of Augustine. Difficulties arise for Bacon in part because the Aristotelian naturalistic account of visual experience leads into one form of epistemology, but, in opposing ways, Augustine's epistemology is generated by his illuminist metaphysics. Bacon attempts to reconcile the two epistemologies and show that the ordinary experience of visual perception provides an heuristic parallel to the experience of divine illumination.

I shall argue that the significance of this parallel has been virtually ignored and undeservedly so. The parallel is paradigmatic of: (1) Bacon's claim that the creator is known through the creature (i.e. that understanding the way in which one comes to know through the process of vision enables one to come closer to understanding the way in which one comes to know when divine illumination occurs), (2) Bacon's primary commitment to an elaboration of Augustinian theology and his facility for adapting Aristotle to secure such ends.

Before arguing this, some comments about the structure of Bacon's discussion of the science of optics are in order. The science of optics embraces both the processes involved in the visual experience as well as
the geometrical characterization of the behavior of light rays. Bacon begins his discussion of the fifth section of the Opus Majus concerning optics with the customary remarks citing the ability and nobility of sight and pointing out that it is the only sense which is worthy of and requires a separate science for itself. The exposition of the science of optics is comprised of three major sections. The first treats visual matters in general and includes descriptions of the various faculties involved in perception, the anatomy of the eye, and the account of the visual experience. The second section is concerned with the geometrical optics of direct vision, while the third section deals with reflection and refraction. The plea for optics concludes with optimistic speculation as to the utility of this science in the understanding of theology and the service of Christendom. The import of such a geometrical characterization is that the formal causes of optics as a purely perspectival science can be known with mathematical certainty.

The methodology implicit in the organization described above (i.e. the proceeding from the general to the specific), as Bacon applies it, invites confusion. The confusion arises primarily because Bacon's initial characterization of the visual process is incomplete.
in this instance he presents only a partial account without stating at the outset that he is only presenting the theory of vision as it applies to the physiology and psychology of apprehending visual impressions. Bacon claims that the First Part of the Optics gives the theory of vision in general and that specific applications of the theory will be further elaborated in the Second and Third Parts. What Bacon does, however, is to give only a very partial account of the general theory in the first two-thirds of the First Part. He discusses vision from the point at which the eye receives the species or visual impression from the object. He does not make clear in this "general" discussion that he holds that there is another essential component to seeing, namely the extramission of species by the seeing eye. The extramission aspect is ostensibly ignored, although the partial treatment of the theory presented by Bacon does not rule out extramission. In the last section of the First Part, Bacon suggests the role of species coming from the eye, but this is after considerable discussion of the condition of vision. My point is that it is just because Bacon states that he is giving a general sketch of the theory of vision that the omission in the first six distinctions of the extramission aspect is misleading.

It is in the Second Part of the Optics, when
Bacon begins with the discussion of the specific defects that affect the visual system that he makes clear by example the significance of extramission in effecting vision. It is also in this Second Part that, using the methodology of proceeding from the general to the particular, Bacon uses specific examples drawn from ordinary experience as well as diagrams and geometrical illustrations to support his claims. The experimental (i.e. experiential) component becomes more pronounced and thus the reader's understanding of the theory supposedly more certain.

In the First Part of the Optics Bacon begins with what appears to be a straightforwardly Aristotelian intromissionist theory. The role of the seeing eye in producing species which modify the visual medium does not occur until the Seventh Distinction in the First Part of the Optics. The First Part of the Optics deals generally with the issues of sight and cognition and introduces the conditions for vision. The activity of the seeing eye in producing species is established only after what I take to be a misleading preliminary treatment of vision. In the Second Part of the Optics when Bacon elaborates the theory of vision the role of species in connecting the geometry of vision to cognition is insisted upon. A second, though much less serious, confusion arising from Bacon's methodology is that his
general characterization immediately takes issue with the difficulties involved in the internal structure of the seeing self (i.e. the anatomy and physiology of the visual system).

In this decade, scholarship concerning Bacon has focused on his place in the development of geometrical and physical optics. David Lindberg has demonstrated Bacon's influence on the optical theories of Pecham and Witelo.\textsuperscript{47} Gareth Matthews has claimed that Bacon's theory is paradigmatic of "the medieval theory of vision."\textsuperscript{48} My contention is that Bacon's theory cannot be sufficiently appreciated if examined solely in this light. The geometrical and physical aspects of the theory of vision are only facets of a theory of perception that is partially constitutive of grander metaphysical and ultimately theological theories. To neglect the place and role of the theory of visual perception within the Baconian enterprise is, I shall argue, to ignore what were for Bacon crucial concerns. This narrow view of Bacon's theory explains, in part, the following interpretation by Matthews:

\ldots it is an openly physicalistic account. Nor does it postulate a neurophysiological processor of information behind the eyes in the brain. It wants to account for vision as the receiving of an impression—a 'species' in Bacon's terminology. But it does not
know about images on retinas. Instead of conceiving our two eyes as two cameras that produce two images containing 'information' that gets processed by some physiological, or non-physiological, processor, it conceives the eyes as the collars of two funnels that direct species or impressions (in the normal case, one from each eye) to the optic chiasma, where they merge and where, as Bacon puts it, 'vision is completed.'

I shall argue that Matthews' characterization of Bacon's theory as primarily physicalistic is misleading. Insofar as Bacon maintains a hylomorphism with regard to species, there is corporeity, hence perhaps in some sense, physicalism. If so, it is a physicalism of a rare and rarefied kind and should be acknowledged as such.

Matthews reads Bacon as, for all practical purposes, advocating an intromissionist theory and fails to take seriously Bacon's complicated and subtle dual use of species in effecting vision. I think that this happens because Matthews tries to remove Bacon's theory of vision from its epistemological and theological moorings.

In the first section of the Optics, Bacon devotes considerable effort to elaborating the requisite conditions for vision. Bacon claims that in addition to species, there are nine necessary conditions for vision. I have remarked that in this early part of the treatment
of optics, Bacon appears to hold an intromissionist theory of vision. Thus, given the context, one is likely to be inclined to limit the species to those produced by visible objects. Bacon does not, however, in this early section specifically exclude the species produced by the eye, and I shall show that such species are essential to his theory.

I read the first condition for vision as the claim that there must be species produced by the seeing eye and the visual object. The other nine conditions are: (1) there must be light, (2) there must be a sufficient distance between the object and the eye (i.e. in order to be seen, an object cannot be in direct contact with the eye), (3) the visible object must confront the eye (i.e. vision is affected along straight lines to the eye), (4) the visible object must be of a magnitude perceptible by the senser, (5) the visible object must be denser than the medium, (6) the medium must be sufficiently rare (it should be noted that Bacon maintains here that species are natural things, and since nature abhors a vacuum, species cannot be propagated in a vacuum), (7) there must be sensible time for vision to occur, (8) the eye must be in a healthy state, and (9) the last condition for sight is position of species.

The elaboration of this last condition is in
large part the task of a geometrical optics. It is meant to demonstrate the spatial relations that must obtain between eyes and objects in order that vision can occur. I suggest that Bacon construes the last two, as well as the first condition of vision, to include the extramission of visual force or species from the seeing eye. This reading is supported in part by the fact that immediately after stating the last condition, Bacon develops his theory with regard to the location of the eye in the skull and its effect on the strength of the visual force produced by the eye. The concern with position, insofar as species issue forth from the eye, is made explicit at the outset of Bacon's discussion of direct vision.

We must consider species not only as regards itself, but as regards position, without which the species cannot be formed or formed distinctly, unless position be carefully noted. We must state, then, that one eye produces its species to the object seen, and that the object seen produces its species to the eye in the same place whence they have a common axis, which is perpendicular to all parts of the eye because it passes through the center of all parts.59

Matthews interprets Bacon's first condition for vision as requiring "an impression of the visible object"60 and that this condition "is both a necessary and sufficient condition for vision,"61 insofar as
"the other nine conditions are therefore as much requisites for the fulfillment of the first condition as they are requisite for vision." Matthews makes explicit his translation of "species" as "impressions" in order to "capture as much as possible of the immediate plausibility of Bacon's theory." Matthews' intention is to make Bacon's theory as attractive and credible to the modern mind as possible. Despite Matthews' good intentions in invoking the principle of philosophical charity, this approach does Bacon a disservice. Bacon's theory probably offends most modern scientific sensibilities because it is so thoroughly grounded in a Christian medieval ontology.

Matthews understands Bacon's theory as basically an intromissionist account in which the passivity of the seeing eye is paramount. He states:

Talk of vision as the receipt of an impression suggests that vision is a passive, rather than an active, affair; and Bacon indeed says that vision is passive ('visus est virtus passiva'). But it is well to note . . . that according to Bacon, some minimal perceptual judgment is an inevitable part or aspect of every receipt of visual impression. So the receipt of an impression has an active aspect as well. And so a Baconian impression is not to be thought of as an immediate and uninterpreted 'given.'

It is also very important to be clear that impressions (species) are not themselves perceptible
Matthews wants to account for the binocular aspect of vision in light of what he takes to be the necessity and sufficiency of the species or impressions condition. He formulates the following six sequential principles that he takes to be the crux of Bacon's account of binocular vision:

(a) $x$ sees $y$ at $t$ if and only if $x$ receives a visual impression of $y$ at $t$.

(b) $x$ receives a visual impression of $y$ if and only if there is some place at which $x$ receives a visual impression of $y$.

(c) $x$ sees $y$ single at $t$ if and only if $x$ receives a visual impression of $y$ at $t$ and any two visual impressions of $y$ that $x$ receives at $t$ merge completely.

(d) visual impressions merge if and only if there is some place at which visual impressions merge.

(e) $x$ sees $y$ single at $t$ if and only if $x$ receives a visual impression of $y$ at $t$ and there is some place at which any two visual impressions of $y$ that $x$ receives merge completely.

(f) the center of vision is not in the right eye or in the left eye but somewhere else, presumably more or less between them.

Matthews claims that this "funnel" theory in which species enter into the eye and produce a visual impression when they meet at the optic chiasma is utterly inadequate.
He offers the suggestion that Bacon may have had some "natural supposition" that there was some internal center of attention which focused attention on the visual object. However, Matthews admits regretfully:

In fact I find no such reasoning in Bacon, and no evidence that what I have called a 'natural supposition' plays any role whatsoever in the way Bacon conceives vision. And it now seems to me instructively appropriate that there should be none. Such reasoning would be appropriate to a philosopher like Augustine, who distinguishes between having a visual impression and attending to something within it—or perhaps better, to something within the visual field it portrays (see De Trinitate 11.2.2). But I find no such distinction in Bacon. To see x is simply to receive a visual impression of x—and that ends the matter.¹

Matthews subsequently emphasizes what he takes to be the utterly passive role of the seeing eye. This he maintains does not allow either for attention to some particular object or the complete lack of attentive seeing by one who is dead or in a stupor.² Matthews does not, however, regard Bacon's remarks on this subject as a serious component of his theory of vision. This is evident in the following:

I do not know for sure what Bacon's answer to this kind of criticism would be, but I am inclined to think that he might appeal to his doctrine of optic emissions. The doctrine of optic emissions seems to be a vestige of the earlier
emission theories of vision
retained out of either an incurable
ecclecticism or else from a genuine
respect for his predecessors.
For whatever reason Bacon has the
doctrine, and here is the way he
tries to keep it from being otiose:

(Matthews then quotes the following section from the
First Part of the Optics.)

. . . The species of the things of
this world are not fitted by nature
to effect the complete act of
vision at once because of its noble-
ness. Hence these must be aided
and excited by the species of the
eye, which travels in the locality
of the visual pyramid, and changes
the medium and ennobles it, and
renders it analogous to vision,
and so prepares the passage of
the species itself of the visible
object, and, moreover ennobles it,
so that it is quite similar and
analogous to the nobility of the
animate eye. 73

Clearly Matthews finds this line of reasoning
ad hoc and unsatisfactory. He does not realize the cen-
tral role of the "optic emissions" in Bacon's theory.
(Later in this chapter I shall discuss Bacon's effort to
argue for a reading of Aristotle and his Arabic sources
as holding theories that are either implicitly extra-
missionist or compatible with extramissionist theories.) 74

Matthews maintains that Bacon lacks Augustine's
sensitivity to the issue of attending to sensation. I
have argued in an earlier chapter that for Augustine, the
principle of vertical causality demands that the soul
be the active monitor of bodily alteration. Bacon allies himself theologically with Augustine and in his own treatment of species emitted from the eye he claims Augustine's sanction:

If we wish to confirm this by the sacred writers, we shall state that they argue in this view, Augustine in particular; for he maintains in the sixth book on Music that the species of vision comes and is propagated in the air to the object. Hence just as an inanimate object produces its own inanimate species, so does an animate thing produce a species that has in it a measure of the force of the soul (anima). For just as an inanimate thing has a relationship to its species, which is similar to it, so is an animate thing related to a species similar to it. A medium, however, which is inanimate will not because of this fact be animate, but will be made like an animate one through its likeness now received.

The Augustinian principle of vertical causality is apparent in the seeing eye's ability to make the medium like an animate thing so that the species from the object can be received. This account bears a striking resemblance to the Platonic theory of vision in which visual fire from the eye must coalesce with the medium (which is a body of light and air). The altered medium forms the visual pyramid. Species from the object transverse this pyramid and fall perpendicularly on the curved surface of the sensitive lense and then travel along the optic nerve to the optic chiasma.
Bacon emphasizes the importance of activity in effecting causal change. I read him as claiming that the seeing eye as noble and active, multiplies its own species (the visual power). This changes the medium and makes the eye receptive to what Matthews has called "visible impressions." The idea that vision is passive—i.e. that the eye is acted upon by the species of the visible object is true, but needs some qualifications. The species emitted by the seeing eye not only ennoble the medium, but they also ennoble the species coming from the object so that they may be apprehended by the various faculties involved in visual perception. The eye is both passive and active with regard to the species of the object, i.e. it receives them, but also transforms them. Simply stated, the eyes of the dead or blind cannot be acted upon or act upon visual impressions from external objects.

What is particularly interesting about this account is that Bacon wants to claim that his view is not the Platonic view but is thoroughly Aristotelian. Bacon's remarks are worth extensive quotation and analysis:

Aristotle, therefore, does not assert that vision is not the result of external transmission, but makes the statement in accordance with the general opinion, and as an example and not as a truth. As to the
fact, also, that in the second book on the soul he tries to show that in general sensation belongs to the class of passive faculties and does not teach that sensation is active, we must state that this was necessary owing to the position of his master Plato and of many Platonists. For it was the common belief among them that vision was only active and that it emitted a visible species for viewing all visible objects, whence according to them vision sends suddenly to the stars a visible species which views them and returns to the sight their species. Therefore Aristotle, who wished to verify all things as far as the possibilities of his age permitted rejects both opinions regarding vision; namely that of the Stoics who maintained that it is passive only, and that of the Platonists who hold, and erroneously so, that it was only or principally active.

. . . those versed in the philosophy of Aristotle and particularly in perspective think that vision is active and passive. For it receives the species of the thing seen, and exerts its own force in the medium as far as the visible object. Since the multiplication of species is instantaneous for every distance, as most people reckon, or rather it does require time, but an insensible amount, this time escapes perception owing to its brevity.

Several items in this passage need clarification.

It is interesting that Bacon's own knowledge of the Platonic theory is crude and inaccurate. He attributes to Plato (or the "Platonists") the claim that there is some visible material species emitted by the eye which
travels to the visible object and then back to the eye. It should be noted that Bacon, like Augustine, is confused about the authentic Platonic position. Augustine's confusion is, however, primarily and generally metaphysical; Bacon is specifically confused about Plato's theory of vision. Bacon, again like Augustine, speaks loosely about the "Platonists" without making his sources clear. This is to be expected as Bacon follows Augustine's lead into inaccuracy. This is culminated in Bacon's interpretation of Aristotle's theory of vision. Because Bacon wants to interpret Aristotle's intromissionist theory as also an extramissionist theory, he claims that Aristotle's apparent rejection of the extramissionist theory is only a rejection of a primitive and naive version of extramission.

The previous passage also supports my contention contra Matthews that Bacon's theory of vision should not be treated as being purely passive, but that vision essentially involves the activity of the eye. Matthews' interpretation of the first condition of vision, i.e. "that there be an impression of the visible object" is simply the requirement that x sees y at t if and only if x receives a visual impression of y at t and that the other conditions of vision simply describe the
empirical constraints for meeting the primary requirement. I contend that Matthews' interpretation of the first condition as restricted to the reception of a visual impression is incorrect. I have remarked previously that in the early sections of his discussion of vision Bacon appears to be holding an intromissionist theory. It is after this preliminary discussion of the physiology and anatomy of the visual system that there is a chapter in the Seventh Distinction of the First Part "in which the true theory is given."

This chapter includes the account of the production of visual species by the eye. It is after extensive discussion of the visual species and the species produced by the visible object that Bacon begins the next distinction by claiming that "After these things we must consider that beside species, nine other things are required for vision." My point is that Bacon uses the term "species" to include both that which is emitted and that which is received. The nine conditions then cited are not simply the conditions explaining how the species requirement is fulfilled. The nine conditions describe the material conditions that must be met for the reception of the species from the visible object. They are additional conditions.

Species can be neither purely material nor purely form. The material aspect of species as involved
in vision is clear. Neither the species emitted from the eye nor the species produced by the visible object can exist without a medium. In addition, the potentiality of species is specific. They multiply infinitely, but they are always determined by their origins. Given this interpretation, they are not pure potentiality.

It should be clear, too, that although superficially one can characterize species as forms that are propagated by the eye and the object, they cannot be pure forms since they are subject to accident. For example, those species coming from the visible object can be ennobled so that they can be apprehended by sight. The power of species emitted from the eye are more or less effective depending upon the health and anatomy of the eye. Thus if the lens is damaged, the visual power is impaired if not destroyed.

Bacon's conception of the ontology of species is also clearly influenced by Grosseteste, particularly Grosseteste's claim that light is corporeity. Bacon's ontology, like that of Grosseteste, is fundamentally hylomorphic. He maintains that in created things matter and form cannot exist separately because matter without form is pure potentiality, pure form without matter cannot be subject to accidents. The species emitted from the eye cannot exist without matter. These
species ennoble the medium and the species from the external object. This is an uneasy resolution of the Augustinian principle of vertical causality with Aristotelian notions of matter and form. The species from the eye are not pure forms (since they exist and act in the realm of created things), but they cannot be straightforwardly material either. If they were, they could not bring about the ennobling of both the medium and external species.

Bacon's discussion of species leads to several difficulties. In treating the species produced by the visible object, Bacon states that:

When they say that species has a spiritual existence in a medium this use of the word spiritual is not in accordance with its proper and primary signification, from spirit, as we say that God and Angel and soul are spiritual things; because it is plain that the species of corporeal things are not then spiritual. Therefore of necessity they will have a corporeal existence, because body and soul are opposed without an intermediate. And if they have corporeal existence, they also have a material one and therefore they must obey the laws of material and corporeal things . . . species is the similitude of a corporeal thing and not a spiritual; therefore it will have a corporeal existence. Likewise it is in a corporeal and material medium, and everything that is received in another is modified by the condition of the recipient.
The difficulty arises because of the sweeping statements about the material existence of the species. It must be remembered that Bacon is speaking here of the species coming from the object of vision. The medium takes on the impression or likeness (i.e., the form) of the object. In the first discussion of species in the Opus Majus (a discussion which takes place in the section on mathematics), Bacon remarks that species can be produced by that which is spiritual as well as that which is material. Species are efficient causes, having their origin in spiritual substance as well as in material substance.

For every efficient cause acts by its own force which it produces on the matter subject to it, as the light of the sun produces its own force in the air and this force is diffused through the whole world from the solar light. This force is called likeness, image, species, and by many other names, and it is produced by substance as well as accident and by spiritual substance as well as corporeal. Substance is more productive of it than accident, and spiritual substance more than corporeal. This species causes every action in this world; for it acts on sense, intellect, and all the matter in the world for the production of things, because one and the same thing is done by a natural agent on whatsoever it acts, because it has no freedom of choice; and therefore it performs the same act on whatever it meets. But if it acts on the sense and the intellect, it
becomes a species as all know. 88

Without making his sources explicit, Bacon appears to be holding a theory very much like Grosseteste's light metaphysics. This is particularly the case with respect to the activity of light. The claims in this passage are more complex. Bacon is making the primary claim that species are efficient causes and that everything produces species. (Bacon simply ignores Grosseteste's claim that all inanimate matter derives from lux and then lumen, but it should be noted that Grosseteste's cosmology is clearly not inconsistent with Bacon's position.)

The species are causes; as self movers they act upon and effect both what is animate and what is inanimate. The light of the sun is given as the paradigmatic case for such a causal characterization. Once the paradigm is understood, the general principles of the activity of species can be applied to other cases.

Given that species is considered both a force and a likeness, the light of the sun is particularly well suited to exemplify the species as an efficient cause. The light coming from the sun is like the light that remains in the sun. Light multiplies itself almost instantaneously. Sunlight is clearly a causal agent. It is a cause of vision and also a source of warmth. The sunlight enables sentient creatures to see (i.e., species
produced by the eye are only effective in a lighted
medium); the sunlight also effects non-sentient
entities (e.g., the sunlight makes the stone warm,
subsequently, the warmth becomes an accident and species
of the stone). Both animate and inanimate entities
can ostensibly be affected in the same way (i.e., both
can become warm by the sunlight), but a sentient
creature can perceive the warmth insofar as it acts on
the senses. The different effects of species upon
sentient creatures will become even more significant
in the explication of the faculties involved in
knowledge acquired thorough sensory perception. (I
shall discuss the claim, which is hinted at in the
last quote that it is possible to apprehend non-
sensible qualities via the apprehension of sensible
species.) Let me now recapitulate the theory of vision
and show how it leads into Bacon's theory of knowledge.
This in turn will ultimately precipitate a further
discussion of ontology and metaphysics and lead back to
what I take to be Bacon's own understanding of his
enterprise.

In summary then the theory of vision requires that
the seeing eye be active prior to vision. This activity
consists in the multiplication of species from the eye
which affect a lighted medium surrounding the eye and
make it ennobling of and receptive to the propagation of visual species produced by the visible object. The ennobled species coming from the object that strike the lens perpendicularly are the visual impressions. It is here that an "incomplete judgment" takes place based on the geometrical structure of the image on the lens. Bacon argues that judgment cannot be completed in the eye because creatures have binocular vision and if each eye judged the species it received, one would be aware of two images. Since this is not normally the case "there must be something sentient besides the eyes, in which vision is completed and of which the eyes are the instruments that give it the visible species." The vision is completed in the common nerve where a single (i.e., combined) image is judged. The common nerve judges the special sensibles of light and color. The common sense correlates the forms apprehended by the senses. The forms are then retained by the imagination.

Bacon states that while it is established that "the concave nerves causing vision have their origin in the brain," there is some difficulty in ascribing the particular functions of visual judgment to specific parts of the visual system (which includes the eyes, optic nerve and brain). He describes the brain as a tripartite organ consisting mostly of phlegm and
enclosed by a double membrane. Bacon wants to preserve the Aristotelian idea of the special object of sense, and he does not want to claim that sensation is simply an alteration of the sense organ. According to Bacon, there are "nine special properties that belong to their own senses . . . of which no other particular sense can form a judgment."\(^{92}\) Bacon, however, lists only eight special properties. He omits (inadvertently, I presume) hearing which judges sound. Sight judges the properties of light and color; touch judges the Aristotelian elemental contraries of heat and cold, moist and dry; smell judges odors; and taste judges savor. The sensory judgments are not conscious (i.e., the eye does not sense that it is seeing), but the sense transmits the "form" or "species" of the perceived object to the common sense along various nerves. Bacon locates the common sense in the anterior part of the brain, thereby following Avicenna who maintains that:

One of the animal internal faculties of perception is the faculty of fantasy, i.e. sensus communis, located in the forepart of the front ventricle of the brain. It receives all the forms which are imprinted on the five senses and transmitted to it from them. Next is the faculty of representation located in the rear part of the front ventricle of the brain, which preserves what the sensus communis has received from the individual five senses even in
the absence of the sensed objects.\textsuperscript{93}

Similarly, Bacon states that the common sense:

\textquote{. . . forms a judgment concerning differences of impressions in the senses, as, for example, that in milk whiteness is different from sweetness, a distinction which sight cannot make, nor taste, because they do no distinguish things in categories . . . It judges concerning the operation of the particular senses, for vision does not perceive that it sees, nor hearing that it hears, but another faculty does, namely the common sense . . . the final action of this faculty is to receive the forms coming from the particular senses and to complete a judgment concerning them.}\textsuperscript{94}

The special senses are activated by the propagated species or forms of the proper objects of sense in their ennobled form. They then transmit the species or forms to the common sense. The forms or species are the special objects of sense. The common sense then correlates the forms coming from the senses, and, in Aristotelian terminology, the sensitive soul becomes aware of itself as perceiving.

The attributes apprehended by the common sense are "distance, position, figure, magnitude, continuity, discreteness or separation, number, motion, rest, roughness, smoothness, transparency, thickness, shadow, darkness, beauty, ugliness, also similarity and difference in all these things and in all things composed
of them." Bacon maintains that the properties
apprehended by the common sense can be reduced to various
combinations of the properties (i.e., forms or species)
apprehended by the special senses:

For common properties are not so
called because they are perceived
by the common sense, but because
they are determined by all the
special senses or by several of
them, and particularly by sight
and touch, . . . [these] are
apprehended by the special senses,
and by the common sense, and by
imagination, and these faculties
of the soul cannot judge of them­
selves concerning other qualities
except by accident.96

The first sentence in this passage indicates that the
properties apprehended by the common sense are permu­
tations of the nine special properties. The common
sense then correlates the reports of the special senses,
so that the sensitive soul is aware of the common
sensibles. For example, the common sense correlates
the impressions of sight and touch so that from a certain
combination of light and color and dryness and coldness
one originally infers the common property of magnitude.97

What is seen and what is felt can be characterized as
having size.

After being apprehended by the common sense, the
forms or species are then retained by the imagination.
Imagination is located behind the common sense in the
first cell of the brain and is simply a storehouse for
the forms and judgments apprehended by the common sense. Perception at this stage is awareness of one or more of the special objects of sense or the common sensibles as well as an awareness that one is perceiving. An additional faculty of the sensitive soul is required to interpret the complex of forms apprehended by the common sense. (This is the estimative faculty, which will be discussed shortly.)

Perception of the special and common sensibles is then comprised of the following sequence. The particular organ of sense receives impressions of the form of the object of sense. These forms or species are transmitted via the nerves to the common sense which is in the anterior part of the brain. The common sense is severely limited insofar as "the final act of this faculty is to receive the forms coming from the particular senses and to complete a judgment concerning them. But it does not retain these impressions owing to the excessive slipperiness of its own organ . . . ."98

In order for thought to occur, one must at least be able to retain this rather elementary judgment. The common sense must be supplemented by a faculty which retains the judgment, namely, the imagination. This combination constitutes the whole anterior cell of the brain.
Bacon again follows Avicenna in claiming that the estimative faculty is located with the faculty of memory in the posterior cell of the brain. The estimative faculty interprets the complexes of forms apprehended by the common sense, and it enables the percipient to infer insensible properties from complexes of sensible forms:

Wherefore not only do light and color produce their forms and impressions, but to a far greater degree do the properties of the complexion, nay, the very nature of things as regards their substances, agreeing or disagreeing with one another, produce strong impressions, which change greatly the sensitive soul so that it is moved to states of fear, horror, flight, or the opposites. These forms or impressions coming from things, although they change and alter special senses and the common sense and imagination, just as they do the air through which they pass, yet no one of these faculties of the soul judges concerning these impressions, but of necessity a far nobler and more powerful faculty of the sensitive soul does, which is called estimation or the estimative faculty, as Avicenna states in the first book on the Soul, a faculty which he says perceives the insensible forms connected with sensible matter.99

Thus the species are able to modify the medium contingent with the sense organ, the organ itself, and the faculties of the sensitive soul. Bacon claims that this faculty allows an animal to immediately recognize its
natural predators.

But there are other sensibles per se, for animals use sense alone since they do not possess intellect. The sheep, even if it has never seen a wolf, flees from it at once; and every animal experiences fear at the roaring of a lion, although it has never heard a lion before nor seen one. The same is true in regard to many things that are hurtful and contrary to the constitution or complexion of animals. The same principle holds good as regards what is useful and in conformity with their natures. For although a lamb may never have seen another lamb before, it runs to and willingly remains with it, and the same is true concerning other animals. Brutes, therefore, have some perception in things advantageous and in things harmful.

Bacon is claiming that some of the non-sensible characteristics of the animal that are being perceived are apprehended by the estimative faculty and produce the appropriate response to the percipient animal. The non-sensible characteristics (harmfulness, etc.) are not apprehended independently of the sensible characteristics (the sound or shape of the potential predator). The estimative faculty is analogous to the common sense insofar as it cannot retain forms. The memorative faculty is the repository of the forms discerned by the estimative faculty, just as the imaginative faculty retains the forms apprehended by the common sense.

Although the estimative faculty enables Bacon
to account for rather simple behavior that has obvious survival benefit, it is not sufficient to account for more subtle and complex behavior in animals. Such behavior Bacon maintains includes not only belief-acquisition, but also a rudimentary sort of syllogistic inference. He attributes this more complex cognitive activity to the cogitative faculty situated in the middle cell of the brain. While the estimative faculty enabled the animal to apprehend qualities of the nature of particular kinds of things, the cogitative faculty allows the animal to make inferences about events, and to anticipate the probably effect given a certain causal sequence. Bacon appeals to ordinary cases of animal behavior to illustrate how the cogitative faculty functions.

But it is well known that a dog recognizes a man seen previously when it sees him again. Moreover, the ape and many other animals act this way, and distinguish between the objects of vision of which they have a recollection, and they recognize one universal from another, as a man from a dog or a tree, and they distinguish individuals of the same species; and therefore the perception which writers on perspective call perception through recollection belongs to animals as well as to men. Therefore this faculty must be a function of the sensitive life. But likewise it is manifest that the same holds true for the perception that is termed perception through the syllogistic
process; for motion is recognized through it; as, for example, a dog, when someone raises a stick to strike it, flees; which it would not do if it did not perceive that the stick is changing position with respect to itself and is approaching it. Similarly when an animal, for example, a dog, cat, wolf, or some other animal, holds an animal on which it feeds, while the prey is still, the plunderer stands motionless; but when the captured animal flees, the plunderer follows until it seizes its victim if it can. It would not do this except for the reason that it perceives that the position of the prey has changed with reference to itself, and therefore it perceives motion and rest and distance. We must grant that animals have some perceptions of this kind by a certain natural purpose and instinct without deliberation, and the faculty that acts is cogitative, which is the mistress of the faculties and employs the other faculties of the soul. 101

The cogitative faculty makes use of the forms received and stored in the posterior and anterior cells of the brain. The cogitative faculty enables the animal to organize information acquired by the common sense and estimation, and to draw a conclusion from it. This is a more sophisticated process than the sequence where the form of the wolf causes a state of fear in the sheep that results in the sheep's running away. Bacon gives the following cases of purposive behavior as examples of the efficacy of the cogitative faculty in animals:

But a certain gathering together of several facts into one consequene
of a natural purpose and instance, the several facts resembling premises and the resultant one a conclusion, because it is gathered from them, can be found in animals. For we see angered apes prepare plots against men and coordinate many things, so that they may secure their revenge, and therefore they assemble into one that which they draw from many sources. We see also spiders arrange their web, not haphazard fashion, but in various geometrical forms, so that flies may be caught easily by them. The wolf eats earth, so that he may be heavier when he seizes a horse or bull or stag by the nose, in order that by reason of the weight of the earth he may weigh down the animal and hold it. I have seen, moreover, a mouser that wanted some fish swimming in a large stone vessel; and when it was unable to catch them because of the water, it drew out the stopper and let the water out until the vessel became dry, in order that it might capture the fish in a dry place. It therefore conceived of several acts, in order that it might secure the end it had in view.102

These examples are problematic for a number of reasons. Bacon seems to be assuming that apparently purposive behavior in animals can be construed as directly analogous to deliberative human behavior. The difficulties with this tacit assumption are aggravated by Bacon's acceptance of misleading and spurious reports about the behavior of certain animals. The example of an earth-eating wolf is extreme. If it were the case that a wolf could infer that in order to hold onto his
prey he would have to outweigh his opponent, and moreover that this could be accomplished by eating the heavy element earth, then Bacon would seem to be hard pressed to distinguish that kind of behavior from what is ordinarily taken to be rational. The case of the apes plotting revenge seems even more problematic. How is the premeditated revenge by apes different from premeditated revenge by men? Bacon is forced to acknowledge the striking similarities between what he cites as the observed data with respect to purposive animal behavior, and purposive human behavior. He can account for the similarities insofar as both men and animals have a cogitative faculty since they are both sensitive, but in animals the cogitative faculty is the substitute for reason, while in men, the cogitative faculty is intimately connected with the rational soul. Bacon remarks that:

Cogitation or the cogitative faculty is in the middle cell and is the mistress of the sensitive faculties. It takes the place of reason in brutes, and is therefore called the logical, that is, the rational faculty, not because it employs reason, but because it is the ultimate perfection of brutes, just as reason is in man and because the rational soul is united directly with it. . . . the cogitative faculty uses all the other faculties as its instruments. In man there is in addition from without and from creation the rational soul, which is
united with the cogitative faculty primarily and immediately, and uses this faculty chiefly as its own special instrument. Species are formed in the rational soul by this faculty. Therefore when this faculty is impaired the judgment of reason is especially perverted, and when it is in a healthy condition the intellect functions in a sound and rational way.  

If my reconstruction of Bacon is correct, then he holds the following summarized views: Through the estimative, memorative, and cogitative faculties, both men and animals can discern universal kinds and particular individuals. Bacon also maintains that animals can act purposively to effect a certain desirable state of affairs, such as the allegedly clever cat which "conceived of several acts in order that it might secure the end it had in view."  

Thus animals and men seem to have much the same sort of sensory information, to process it in the same way, and to use it to achieve similar ends. If Bacon's wolf, cat, and ape cases discussed previously were authentic instances of animal behavior (as he clearly takes them to be), then there would seem to be no purely observational basis on which he can qualitatively differentiate intentional animal behavior from intentional human behavior. The distinction must be made on other grounds.

Bacon's use of Augustinian perfection terminology
is not especially helpful in providing criteria for distinguishing genuinely rational behavior from the parallel behavior in animals, but it does indicate the sort of constraints that Bacon's theology places upon his psychology. Man is more perfect than the animals because he was infused with a rational soul at conception in addition to the merely generated sensitive soul. However, given man's fallen state, all cognitive processes depend upon the forms initially given in sensation. The forms or species apprehended by the various faculties and organized by the senses are a necessary, although not a sufficient, condition for engaging the rational soul in discursive thought. Bacon's psychology thus leads into his theology.

In discussing knowledge per se and per accidens, Bacon suggests that the perception of the special sensibles by each sense occurs because that sense and the medium through which the species is transmitted are different. Claiming the support of Aristotle and Avicenna, Bacon declares that:

\[ \ldots \text{ the medium and the senses do not have the nature of the sensibles whose species they must take up in order that they may judge concerning the sensibles perceived by means of these species. Whence the humor glacialis does not possess some nature of light and color to the degree possessed by objects outside it. For although} \]
the eye has light, this in respect to the perception of color, not in respect to light because the object acted upon does not possess in actuality but in potentiality the ability to become like the agent. 105

Bacon seems to be claiming that the sense must become like the sensible object; in some sense it takes on or becomes like the sensible form of the object. There is a transformation from the potential to actual. If the senses had actively the actual nature of the sensible species from the object, the change from a potentially sensing sense to an actually sensing sense could not occur. Change in the sense is then required for sensation. The species from the object are propagated through a medium which impinges on the sense organ. If this were not the case, the sense could not distinguish the medium from the species or the species from the sense itself. (It is important to remember that Bacon is not claiming that the eye is passive with regard to sensation. In an earlier part of this chapter I have tried to emphasize the active role of the eye in making possible the reception of species from the object.) 106 It is, however, only when the eye does receive these species from the object that it becomes an actually seeing eye.)

Bacon wants to use some criterion of incorrigibility for what is known per se. A sense perceives per se
when it perceives with immediate certainty (e.g., perception of the special objects of sense by the individual sense and the perception of the common sensibles by the sensus communis). In short, his position is that what is sensible per se can be perceived without error when the usual conditions for sensation are satisfied. Hot, cold, moist, and dry are apprehended per se to touch, per accidens to sight. Such per accidens perception involves the estimative, memorative, and cogitative faculties, for these apprehend by way of sensibles previously apprehended per se through their proper senses and the common sense. For example, recognizing the harmfulness of the wolf, that the dog is a greyhound, that this is the same dog that had been seen previously, etc. are instances of such knowledge per accidens. Consequently, the natural kinds of substances of animate (e.g., man) and inanimate (e.g., earth) things are known per accidens.

The account of visual perception per se and per accidens is complicated by Bacon's inclusion of "universal modes of perception through vision." These Bacon attributes to Alhazen with the caveat that the translations were inexact and that Bacon's own exposition is really what Alhazen meant. Bacon maintains that there are three universal modes of perception in vision.
Bacon first discusses these modes at the end of the First Part of the Optics. The discussion is then elaborated in the Second Part after a discussion of vision along a straight line. The Second Part concludes with a further explanation of the role of the faculties.

I shall begin with Bacon's first formulation of the three modes. The first mode is that of the direct perception of light and color by the sense of vision alone. This mode of perception immediately apprehends the special sensibles of light and color *per se* as universal. Bacon's use of the term universal needs qualification. The light and color are apprehended universally insofar as the sense is unable to discriminate kinds of light and color. Bacon claims that this immediate perception apprehends the light and color not only as universals, but also as *indefinite particulars*. This leads into a discussion of the second mode:

We must bear in mind, however, that when the statement was made that vision perceives color or light as a universal by the sense alone, and not as a particular, the particular is excluded which is lower in the line of predication, as, for example, the species of color. Again, particulars designated by the species of something are excluded, as the light of the sun, and the light of the moon, because perchance light does not have species but modes, because all lights of stars have their origin in the rising sun. But the *indefinite particular* is not excluded,
for it is as general as its own universal and is convertible with it as some color, some light, some man and some ox. Therefore the recognition of universals from one another and from particulars and particulars from one another by a comparison of a thing seen with the same thing seen before, by recollecting that it was seen before and known to the beholder, produces here a second mode of comprehension through vision.109

Bacon maintains that the first mode of visual perception apprehends the universal form of light or color (i.e., it apprehends that there is light or color), but does not apprehend that the light is a particular kind of light (e.g., sunlight) or that the color is a particular kind of color (e.g., red). This is not to be confused with the abstractions of universals by the higher faculties. Bacon infers though that the apprehension of the universal, color, or light includes the apprehension of the indefinite particular of some color, some light, because if there is color, there is some color, if there is light, there is some light.

The second mode of visual perception requires memory and involves "all things in which we distinguish the universal from the particular and particular from one another."110 In this kind of perception, one discriminates between particulars (e.g., this red and this black are different colors), and one is able to recognize particulars that one has seen before. Bacon uses the example of
seeing this man that one has seen before. One apprehends that one is seeing a man (i.e., one recognizes the particular instantiation of a universal), and one apprehends that this is the man that one has seen before (i.e., this particular man is distinguished from other particular men by means of the faculty of memory). This kind of visual perception is not the exclusive province of man. Animals, too, can recognize new instances of a universal and discriminate between individuals. I shall argue that the issue of animal cognition plays a decisive role in Bacon's ultimate analysis of knowledge.

The third mode of visual perception "cannot take place by the sense alone, and does not depend on a comparison with previous vision, but without limitation considers the thing present." In this mode judgments are made in accordance with syllogistic reasoning, but it is so swift that one usually does not notice that reasoning has occurred.

For a man reasons naturally without difficulty and labor; as, for example, when a boy is offered two apples, one of which is finer in appearance than the other, he chooses the finer one, but for no other reason than it looks finer to him, and for this reason should be chosen rather than the other. Whence he follows this reasoning; that which is finer in appearance is so far is better, and what is better is rather to be chosen, therefore the finer in appearance
should be chosen; and yet he does not perceive that he is reasoning, because the swiftness of the reasoning process is innate in man. . .\textsuperscript{112}

In his summary of these modes of visual perception, Bacon indicates that the first mode "is called the sense alone when vision is in the pupil and in the common nerve reaching to the common sense."\textsuperscript{113} The second mode utilizes imagination and memory in addition to the seeing eye and the common sense. The third mode requires some form of reasoning. Bacon maintains that this last mode cannot be sufficiently understood without a further elaboration of the processes involved in vision. This is the conclusion of the first of the three parts of the Optics. (This is another instance of Bacon's tendency to present his ideas originally in an incomplete way.)

It is worth reiterating that it is in the Second Part of the Optics, a section ostensibly concerned with ordinary geometrical optics, that Bacon develops most thoroughly the extramission component of his theory of vision.

It is in this Second Part of the Optics that Bacon attempts to clarify not only the different kinds of judgments precipitated by vision, but also the kinds of errors that occur when the visual apparatus is defective. He is, in the former case, elaborating the
third mode of perception and is consequently concerned with perceptual judgments ostensibly requiring reasoning. In the latter case, that of errors arising from anatomical defects and weaknesses, Bacon assumes that the person having such defects is somewhat aware of the impairment and compensates as best he can. He is concerned with accounting for physiological errors in the visual system. He is not trying to develop a means by which mistakes in perceptual judgments can be detected.

It is here, after the preliminary discussion of the physiology and faculties and modes involved in visual perception, that Bacon suddenly and without any indication of a shift in position, assumes a rather Platonic view of the visual process. Bacon's use of the fountain metaphor and image of the visual force as a stream is similar to Plato's discussion of the visual ray streaming from the eye. I take it that Bacon holds this view implicitly in the First Part and that the Second Part of the Optics amplifies the first. In the conclusion of this section Bacon attempts to elaborate the previous account of the faculties involved in vision and cognition and the kinds of knowledge produced. (I will develop the import of this later when I argue that Bacon's metaphysics and epistemology require an extramission theory of vision.)
In treating the sorts of errors that occur with regard to vision, Bacon begins with the effect of the placement of the eyes in the skull. He claims that persons who have deep set eyes see further than persons whose eyes are comparatively prominent. He gives these reasons for this: the first is that the deep seated eye has more strength "owing to its greater proximity to the common nerve in which is located the visual force, as in a fountain;" the second is that the surrounding bone protects the more recessed eye; the third reason is that "the visual force is more concentrated and unified, while it is more covered within the concavity of the bone, so that it thus takes a narrower and straighter path to the object seen, and is less scattered and dilated, so that it thus falls into the position of the visual pyramid." The first and third reasons clearly assume some sort of extra-mission theory. The fountain analogy is particularly forceful.

Bacon supports his claim that deep-seated eyes see better than prominent ones by recourse to ordinary experience. He argues that "when a man wishes to view something at a distance with care, he applies the hollow of his hand to the bone of the eye, in order that the visual force may be more concentrated and less
dispersed." In shading one's eyes, light is deflected and the pupil dilates. Bacon uses this example to strengthen his claim that the visual power must be narrowly channeled. Instead of the back of the cupped hand deflecting the sunlight impinging on the eye, Bacon seems to be suggesting that the gesture is effective because the palm of the hand deflects the visual force back into a more concentrated stream. Thus deflected it can go further.

The relations of the structures of the eye to the ability to perceive things at various distances is further corroborated by the example of the eyes of fish. Bacon makes this empirical claim that fish do not see well at a distance and accounts for this by the lack of eye lids and eyelashes which allow the visual force to be diffused. Bacon also claims that eyelashes guard the eye from excesses of heat and cold. The emphasis on empirical support for his account and the demonstration of a benevolent teleology implicit in the visual apparatus becomes more pronounced and significant.

It is here that we begin to see more clearly, by use of examples, explicitly what is involved in the whole theory of vision. It is through the particular examples that we come to know the general theory.

It is here, too, that Bacon begins talking about
causality and teleology in a way which is similar to the discussion at the beginning of this chapter in which Bacon talks about the relation of philosophy to theology.

Another characterization of the active nature of the eye is that it has, as it were, its own light. In discussing the variations among individuals in the ability to see in brightly or dimly illuminated circumstances, Bacon remarks that one reason that individuals can see in relative darkness is that "the eye has a great deal of light of its own." That the eye contains its own light is proven by pressing on the eye in the dark. The pressure causes the sensation of seeing light.

Bacon, like most Franciscans, seems to maintain a derivation of the Augustinian doctrine of seminal reasons that potentiality is conceivable only insofar as it is a potentiality to be specifically realized. The affectation of the sensitive soul by the species received in the common sense and the imagination is consistent with the interpretation that the species are corporeal forms which multiply themselves and transform the medium from a state of potency to actuality. Thus Bacon claims that:

... the species is not a body, nor is it changed as regards itself as a whole from one place to another,
but that which is produced in the first part of the air is not separated from the matter in which it is, unless it be soul, but the species forms a likeness to itself in the second position of the air and so on. Therefore it is not a motion as regards place, but is a propagation modified through different parts of the medium; nor is it a body which is there generated, but a corporeal form, without, however, dimensions per se, but it is produced subject to the dimensions of the air; and it is not produced by a flow from a luminous body, but by a renewing from the potency of the matter of the air. . . . 122

This last clause supports the claim above that potency is always specific to a particular actualization: the species which are corporeal forms are produced by "a renewing from the potency . . . ." Each species generates itself anew at each instant, rather than having a continuous flow from the object. Moreover, the medium itself must have the potential to be informed.

Thus Bacon argues that there must be species radiated from the eye in order for vision to occur, "because accidental qualities and substances inferior to vision are able to produce their own forces; much more therefore has vision this power."123 The visual species transform the inanimate medium into a likeness of the animate medium. Here Bacon is operating within the Augustinian metaphysical framework. In order for the literal communication of the species between the
inanimate and the animate medium to occur, the inferior medium must be elevated to its most perfect actualization. Because Bacon accepts the Augustinian principle of vertical causality that the inferior cannot affect the superior without its tacit consent, his own theory requires that the act of seeing originates in the animate medium of the eye. Bacon therefore argues that:

\[...\] vision must perform the act of seeing by its own force. But the act of seeing is the perception of a visible object at a distance, and therefore vision perceives what is visible by its own force multiplied to the object. Moreover, the species of the things of the world are not fitted by nature to effect the complete act of vision at once because of its nobleness. Hence these must be aided and excited by the species of the eye, which travels in the locality of the visual pyramid, and changes the medium and ennobles it and renders it analogous to vision, and so prepares the passage of the species itself of the visible object, and, moreover, ennobles it, so that it is quite similar and analogous to the nobility of the animate body which is the eye. \[124\]

Vision is essentially active, transforming the medium by the propagation of its own species, ennobling the species emitted by the visible object. Bacon locates the source of the visual power in the crystalline lens of the eye (\textit{anterior glacalis}) because if the lens is damaged, the eye loses its power to see. The lens is light sensitive, and "experience(s) a feeling from the
impression (species) that is a kind of pain." The argument Bacon cites is taken from Alhazen. Bacon identifies Alhazen has a concurring authority. Alhazen maintained that the lens was sensitive, but he did not hold an extramission theory.

As noted above, the species propagated by the perceived object are multiplied in straight lines in the modified inanimate medium until it reaches the animate medium of the optical nerve. The natural laws of physics—i.e., the laws of geometry—are no longer operative with respect to the propagation of species once the species are in the optic nerve. Bacon remarks:

And in this fact we must wonder at the power of the soul's force, in that it causes the species to follow the tortuosity of the nerve, so that it flows along in a tortuous line not along a straight one, as it does in the inanimate bodies of the world. For while it is in an inanimate medium it always travels along straight paths, as stated above: but owing to the necessity and nobility of the processes of the soul, species in an animated medium keeps to the path of the medium and disregards the common law of natural multiplication, rejoicing in the special privilege of the soul.
Bacon was acutely aware that Avicenna, Averroes, and Alhazen rejected the extramission theory of vision. He tries to reconcile his formulation of the extramission theory with the views of the Islamic philosophers by maintaining that they were reacting against what he takes to be a primitive Platonistic theory that some discernable material substance must emanate from the eye to the object in order for vision to occur. He claims that his own more sophisticated version of the theory of visual species would not be objectionable to them. Thus Bacon asserts that:

... they are not opposed to the generation of the species of vision, or to the part it plays in producing sight; but they are opposed to those who have maintained that some material substance as a visible or similar species is extended from the sight to the object, in order that vision may perceive the object itself, and that it may seize upon the species of the object seen and carry it back to the sight.  

Bacon believed that the doctrine of visual species as corporeal forms that enable the potentially seeing eye to become an actually seeing eye circumvents the objections to an emanation theory put forth by Avicenna. Avicenna's argument against emanation is that:

Whatever emanates is either a body or a non-body. If it is not a body it is absurd to attribute motion and change of place to it, except figuratively in that there may be
a power in the eye which transforms the air and other things it encounters into some sort of quality, so that it may be said that this quality 'came out of the eye.' Likewise it is absurd to hold the view that it is a body ... 130

Bacon, of course, holds that the visual species are precisely the kinds of powers that Avicenna speaks of. He insists that these species have corporeal being.

This is the claim discussed earlier in this chapter, that species are not, strictly speaking, bodies but corporeal forms. The forms are forces or powers which are realized in the matter of the medium in which they propagate. The species cannot exist apart from matter (i.e., they cannot exist in a vacuum). They are the formal and efficient causes of the transformation of the medium.

However, it must be reiterated that Bacon's concept of species is complex. The implications of the hylomorphic ontology introduced previously now need to be more adequately treated. The essential premise is that in created entities form cannot exist without matter, nor matter without form. This seems at first to be the ordinary Aristotelian distinction between form and matter, but Bacon's interpretation of this distinction is firmly within the confines of Augustine's Neoplatonism. The distinction between form and matter is
explicated in terms of the Augustinian levels of being and the principle of vertical causality.\textsuperscript{132}

I have shown in an earlier chapter that Augustine argued that God is simple, triune, and has being.\textsuperscript{133} God is the ultimate being and His being is not subject to accident (re: argument concerning the single and necessary nature of the trinity). He is fully realized, entirely actual. He is a purely spiritual substance entirely. God cannot be affected as he is the ultimate being---i.e., that being which has no potency and is not subject to accident. Other levels of being must be distinguished as they deviate from this ultimate being.

The antithesis of God would be that which is entirely without substance and is entirely subject to accident. The antithesis of what is fully actual is that which is fully potential. What is entirely potential cannot be actual. Therefore what is purely potential and completely subject to accident cannot exist. (If it were to exist, it would be actual.) Matter is potential insofar as it is receptive to form, but as it is actually receptive of form, it is not merely potential.

It is at this point that having discussed the theory of vision and the stages of perceptual cognition that attention must be paid to the higher realm of
Bacon's epistemology—i.e., his discussion of the active intellect and its effect upon the rational soul.

This discussion of the active intellect and Bacon's explication of divine illumination will illustrate how his epistemology is shaped by his metaphysics. Moreover, the discussion of the active intellect and divine illumination will show how Bacon is able to distinguish the kind of knowledge man has from the kind of knowledge acquired through the perceptual cognition of animals. The discussion will also indicate how the theory of visual perception provides a parallel to divine illumination.

I shall argue that Bacon's treatment of the nature and function of the active intellect must be understood in terms of Bacon's commitment to Augustinian theology. Bacon focuses on Aristotle's admittedly cryptic distinction between the passive and active aspects of nous, and he interprets it in a way that makes it compatible with the Augustinian theory of divine illumination. Bacon develops an epistemology based on what he takes to be a fundamental dichotomy between the passive/potential human intellect and the active intellect, which he identifies with God. He gives special attention to Aristotle's analogy between the effect of the active intellect upon the passive intellect, and the effect of light making potential
colors into actual colors (430a - 14-18). Bacon then interprets Aristotle as claiming that the active intellect knows all things and is always actual. Thus, he concludes that the active intellect is God, since only God is omniscient and eternally actual. Bacon is claiming that knowledge or understanding of truths requires the illumination of the active intellect, that is, direct and immediate assistance of the divine mind. This, of course, derived from Augustine's epistemology. Although Bacon recognizes that Augustine did not identify divine illumination with the active intellect (for indeed, Augustine was not sufficiently acquainted with Aristotle's thought or terminology), he maintains that, in retrospect, Augustine's work does seem to point toward the identification of divine illumination with the active intellect. I shall argue that Bacon's interpretation of the nature of the active intellect clearly conflicts with the spirit and the letter of De Anima. It seems incompatible with the Aristotelian schema to maintain, as Bacon does, that the active intellect is an external force acting upon the passive intellect.

It has been observed that Bacon's interpretation of the nature of the active intellect developed as he matured philosophically. He seems to have held three
distinct positions on this issue. Originally he maintained that the active intellect was the superior part of the human soul and as such, was able to illumine and understand the essences implicit in sense perception. He later claimed that the active intellect was distinct from the human possible intellect, but this active intellect was not identified with God. His final position was to identify the active intellect with God. This is the position assumed in the *Opus Majus*.

Bacon begins his argument by reiterating the claim that ultimately all truth belongs to Christ. The truth that can be found in the writings of the philosophers was attained because the philosophers were divinely illumined. Bacon alleges that philosophers themselves admit this:

For they maintain that there is an active intellect and a possible intellect. The human soul is called possible by them, because it has of itself capacity for sciences and virtues and receives these from another source. The active intellect is the one which flows into our minds, illuminating them in regard to knowledge and virtue, because although the possible intellect may be called active from the act of understanding, yet in assuming an active intelligence, as they do, it is so called as influencing and illuminating the possible intellect. And since it is necessary for the convincing proof of my position to show that philosophy exists through the influence of divine illumination,
I desire to prove this point conclusively, especially since a grave error has invaded the rank and file of philosophers in this particular, and also a large number of theologians, for what a man is in philosophy, that he is proved to be in theology. Now Alpharabius says in his book on the intellect and the apprehensible that the active intellect, of which Aristotle has spoken in his third book on the Soul, is not matter, but is a separate substance. Avicenna also teaches the same principle in his fifth book on the soul. . .137

Bacon is ostensibly rejecting the Averroistic interpretation that there is one active intellect which is common to all men. (This would jeopardize any idea of personal survival after death.) He very loosely allies himself with the positions of Alpharabius and Avicenna in claiming that the active intellect is separate and individual. The passage emphatically demonstrates that Bacon takes illumination to be the essential to his epistemology. The subordination of epistemology to metaphysics and theology is assumed throughout.

This identification of the active intellect with God and the adaptation of this to an illuminationist epistemology and metaphysics solves the problem which arose for Bacon in the consideration of the cognitive activities of animals. Both men and animals acquire knowledge via the senses. In both there are faculties which enable the percipient to reason practically.
The distinction between the kinds of knowledge that animals and men can acquire ultimately can be made with regard to the distinction between the two kinds of experiential knowledge. Given Bacon's generous estimation of the implicitly rational character of much animal behavior (re: cat, ape, and spider cases), the distinction is not to be made simply with regard to the rational application of such knowledge. As I reconstruct Bacon's epistemology, he makes the distinction primarily on the grounds that only man is capable of having the higher, better, and more certain kind of experience—i.e., that of divine illumination. It is my contention that given the principle of vertical causality, divine illumination is necessary in order to apprehend final causes. Thus, as I shall show, one cannot have complete and certain knowledge without the agency of the active intellect in making final causes known.

In the Opus Majus Bacon identifies the possible intellect with the rational soul, for it is that which has the capacity to know the practical and theoretical sciences. At the same time, it is the form of the individual human body, and as such, is united to and is the perfection of the body. The relation of soul to body is problematic metaphysically since the body is
corruptible. The activity of the embodied soul culminates in the activity of the passive or possible intellect. The Augustinian idea of the body as the tool of the soul is in uneasy alliance within the Aristotelian notion that soul is the actuality of the body. This is because for Aristotle the soul can not exist apart from the body (i.e., one cannot conceive of a soul as a separate substance). For Augustine the soul uses the body, but will be separated from it. Bacon states that "the possible (intellect) is incorruptible in regard to its substance and corruptible in regard to its being on account of its separation." The substantial incorruptibility of the possible intellect secures personal survival after the death of the body. Since the being of the soul, however, is that it is the actuality of a body, this actuality is corruptible because the body is corruptible. This actuality (the actuality which is being the user of the body as tool) ceases with the death of the body. Thus, in this respect, the possible intellect is corruptible. However, insofar as the possible intellect is created as an individual and immortal substance, it cannot perish. Only that which is generated is susceptible to corruption.

The possible intellect is also possible qua its coming to know "truths and virtues" through the
agency of the active intellect. The Augustinian
principle of vertical causality is again fundamental to
Bacon's epistemology. The possible intellect becomes
actual (i.e., actually knowing) when it is acted upon by
the active intellect. On the basis of text and
authority, Bacon argues that the active intellect
cannot be a part of the human soul. Bacon cites
Aristotle's statement that "the active intellect knows
all things and is always actual" and concludes from
this that since only God can know all things, the active
intellect must be God. The active intellect is not
part of the soul because "if it were part of the soul,
the soul would then know the same thing through the
active intellect and be ignorant of it through the
possible intellect, because the active intellect is in
actuality what the possible is in its potentiality."

The argument is that the soul cannot be simultaneously
potentially and actually knowing. The active intellect
is the agent that enables the possible intellect to
become actually knowing. The objects of the possible
intellect (i.e., sciences and virtues) when fully
understood, include knowledge of the divine plan. Given
the principle of vertical causality, such knowledge
cannot be acquired by the unaided human intellect.

Bacon gives special attention to Aristotle's
analogy between the effect of the active intellect upon the passive intellect, and the effect of the light of the sun making potential colors become actual colors.\textsuperscript{141} Bacon emphasizes that the light is not color but rather that it "drive[s] away the darkness from colors."\textsuperscript{142} This is clearly not Aristotle's characterization. The image of driving away darkness is an important scriptural image.\textsuperscript{143} For Aristotle, color and light are the special sensibles of sight, hence actual colors are colors that are seen.\textsuperscript{144} In an earlier chapter I argued for an interpretation of the active intellect as that which makes knowledge possible \textit{qua} its function as a conceptual framework. This actuality is the logical condition for any possible knowledge. My contention is that it can be construed as the ontological foundation of Aristotle's epistemology.\textsuperscript{145} The active intellect makes thinking possible since it is the "form of forms."\textsuperscript{146}

Bacon, I suggest, thoroughly misunderstands Aristotle's notion of the active intellect. For the reasons cited above, he believes that the active intellect is ammenable to an Augustinian illuminationist interpretation. The ontological necessity of the identification of the active intellect with God is primarily a theological rather than a logical requirement for Bacon.
This is entirely understandable as Bacon would not be willing to distinguish between the dictates of theology and logic. For Bacon, theology has an overriding logic that is God's. Such a logic is not entirely comprehensible to the individual; it supercedes the logic of mortals. In identifying the active intellect with God, Bacon holds that it is substantially distinct from the possible intellect. Thus the active intellect is a force which acts upon the passive/potential human intellect. This is essentially Augustine's claim that knowledge and understanding of metaphysical truths require the direct and immediate assistance of God's grace. The above characterization of the active intellect, even without its particular identification of the active intellect with the Christian deity, is clearly more Neoplatonic than Aristotelian. Bacon is aware that his interpretation of the active intellect may be challenged as unfaithful to Aristotle's intent. He acknowledges the apparent textual evidence to the contrary of his own interpretation in the Aristotelian corpus, but he points out that in the translation of Aristotle "passages have been translated obscurely and unintelligibly, in which any one may contradict another." The fault is with the translation and not Aristotle for "so great an author does not contradict himself."
Bacon further claims support of Adam Marsh and Robert Grosseteste in holding that the active intellect is essentially different from the soul.  

Bacon develops several arguments to substantiate his interpretation of Aristotle. He uses the analogy developed by Aristotle of the sailor of a ship who directs the ship but is himself not the perfection of the ship. The analogy between the active intellect and the sailor who is not either a part of a perfection of the ship leads to the inference that the passive/potential intellect is the perfection of the body, and in the Aristotelian sense that it is the actuality of the body. But this idea of the soul as the perfection of the body seems to run contrary to the fundamental Augustinian notion that the body is the tool of the soul. Bacon cannot maintain simply that the soul is the perfection of the body since the soul is immortal and does not perish with the body. In contrast to his relatively clear characterization of the active intellect, Bacon is ambiguous and evasive about the specific nature of the passive intellect. This is apparent in the following passage in which Bacon completes Aristotle's sailor/ship analogy:

Yet the sailor is not the perfection of the ship but only its director. Moreover, in that case the soul would be composed of a separate substance.
and one that would be united [with the body], but this is impossible. For intellect, or angel, and soul differ according to species as respects capacity or incapacity of uniting with the body, and therefore the soul cannot be composed of something that is the actuality of the body, and of something that is not such. For one species cannot have in its composition something pertaining to another opposite species.

The possible intellect is the form or species that is the actuality of the human as embodied. It is united to the body in life, but endures as separate after death. The active intellect is not embodied and does not unite with body. However, the active intellect effects the passive intellect which is united to the body. Insofar as it is like the active intellect in its limited capacity for knowing, the passive intellect can be acted upon by the active intellect. Insofar as the passive intellect is like the body, it can unite with the body and act upon it. The difficulty is obviously in accounting for the way in which the passive intellect can be like the body. Although Bacon does not attempt a resolution of this issue, perhaps his adherence to a hylomorphic ontology of created entities can allow for some interpretation of likeness. The soul is the actuality of the corporeal human body, infused at its creation. Both the soul and the corporeal body are composed of form and matter. Completely uninformed
matter is pure potentiality; it is not a substance since it cannot subsist without form. Hence, matter is essentially receptive to form.

The potential/passive soul is the actuality of the body. It is similar to and can unite with the body in its own material aspect of potentiality. The passive soul as separable from the body after death is more than just the animating principle of the receptive body. As a separate created substance, it, too, is composed of a potential aspect. As created and potential, it can unite with other created entities. As immortal and capable of coming to know, it can be united with the Divine light. The illuminist epistemology is preserved within an ostensibly Aristotelian schema.

Thus, I have argued that Bacon's interpretation of the cognitive processes involved in the rational soul is thoroughly permeated with Augustine's Neoplatonism, despite his emphasis on his Aristotelian affinities. Bacon develops an epistemology based on what he takes to be a fundamental dichotomy between the passive/potential human intellect and the non-human active intellect. Bacon gives special attention to Aristotle's analogy between the effect of the active intellect upon the passive intellect, in acquiring knowledge of the sciences. However, one must bear in mind that Bacon maintained that
knowledge could be obtained in two ways: by demonstration and by experience. Knowledge can only be certified by experience, but, as I have shown previously, for Bacon experience itself is of two kinds: experience via the senses, and the experience of divine illumination. His assertion that "these are the two roads by which we arrive at the knowledge of facts," the latter road, however, "is by far the better way" has been previously cited. Purely empirical (i.e., sensory) knowledge is incomplete. For Bacon and his contemporaries, complete knowledge of a thing included knowledge of final causes, (i.e., knowledge of the Divine Plan), and because the nature of the final cause is super-natural, the constraints of the principles of vertical causality require that the final cause is not given in sensory experience, but in revelation. One is divinely illumined by the agency of the active intellect. Consequently, the Aristotelian causal terminology assumes theological implications:

From the Scriptural statement therefore of Genesis, 'I will place my bow in the clouds of Heaven, that there may be no more a deluge over the earth,' we learn the final cause of the rainbow itself, from which the efficient cause and the way in which the rainbow is produced can be investigated. The manner of its production was not clearly understood by the philosophers as their books show us. And such is
the case in regard to every creature. For it is impossible for a man to know the ultimate truth of the creature as it is employed in the Scripture unless he shall have been especially illumined by God. For creatures are employed there because of the need of bringing out the truths of grace and glory, concerning which the philosophers were ignorant, and therefore did not attain the ultimate power of knowledge in regard to creatures, as the sacred Scripture contains in its own vitals. Hence the whole excellence of philosophy lies in the literal sense when philosophy has been adorned with the sacred mysteries of grace and glory, crowned as it were by certain very noble pictures and colors. 

The ultimate purpose of human creation is that the soul can achieve salvation and enjoy the beatific vision. This information is found in the Holy Scriptures which are the revealed word of God. Just as one needs science to understand particular passages in the scriptures, one needs scriptures to understand the creation. The final cause of vision is that man may have knowledge of God through His creation. Vision is an instrument that enables one to know the sensible world can be instrumental in coming to know God.

Bacon posits seven stages of internal knowledge, the first of which "is reached through illumination relating purely to the sciences." This, of course, is derived from the postulate that the Creator can be
known through the creature. Bacon indicates that through the estimative, memorative, and cogitative faculties, one grasps the experience of individuals. The illumination of the active intellect enables one to see the underlying structures and to grasp causal relationships. The second stage of illumination is the knowledge of virtue "which clarifies the mind so that a man comprehends not only moral but scientific truths." The order of these stages of illumination does not seem particularly crucial for Bacon, and he seems to suggest that the second stage can precede the first, or that they can occur simultaneously. The distinction between the other stages and the sequence of attaining them appears to be arbitrary with the notable exception of the seventh stage which is ecstasy and mystical union. I suspect that the seven stages are not a carefully worked program for spiritual development, but are rather a literary flourish that is illustrative of Bacon's strong Neoplatonic tendencies and, as we have seen in the analogy of the eye, of his apparent fascination with the religious significance of the number seven. Bacon confidently asserts that "he who has diligent training in these experiences or in several of them is thus able to assure himself not only in regard to things spiritual but also in regard to all human sciences."
Since Bacon is not specific about which stages are necessary and sufficient for complete spiritual or scientific knowledge, I take this as evidence that Bacon had not developed this progression in any philosophically rigorous way. Bacon, I surmise, merely uses this device of the seven stages to emphasize the importance of coming to know scientific truths as the initial step in coming to know God. This is consistent with the suggestion that for Bacon, one does not know a thing completely until one knows its final cause. Knowledge of final cause is, I have argued, knowledge of the divine plan. Knowledge of the divine plan enables one to closer approach knowledge of the divine mind. Again we see that Bacon uses the Aristotelian causal terminology to express Neoplatonic epistemic goals.

The Augustinian interpretation of potency and act still holds despite the active intellect's being an external force. The human soul has the potential to have actual knowledge of God, but in order for the inferior human mind to realize this knowledge, it must be acted upon by a superior agent, namely, the active intellect.

The claim that the Creator is known through His creation (which includes the creature) is particularly exemplified in the case of vision. Bacon maintains that there is a parallel between the natural process of
vision and divine illumination of the mind. This is again a major part of Bacon's endeavor to show the interrelationship between sacred and profane knowledge. If one understands the way in which vision works in the acquisition of mundane knowledge, then, by analogy, one can have some understanding of the way in which one attains knowledge of the divine.

And we have said that there are required for vision not only internal reception, but external transmission, and cooperation by its own force and species; similarly the spiritual vision requires not only that the soul should receive from without, namely, from God, graces and virtues, but that it should cooperate through its own virtue, for the exercise and agreement of one free will are required together with the grace of God to the end that we may see and secure the state of salvation. 159

This passage epitomizes Bacon's fundamental adherence to an epistemology which is thoroughly grounded in Augustinian theology. Although one cannot by good works and prayers cause God to bestow his illuminating grace (this would clearly violate the principle of vertical causality), without such acts, one cannot hope to be illuminated. One is required to will, to act, and believe in accordance with God's grace in order that one might come to some understanding of the divine. Moreover, given Bacon's commitment to both the Augustinian illuminationist epistemology and the premise that the Creator is known
through the creature, Bacon must hold that the eye cannot be merely passive, but must emit its own species.

The eye cannot see without light; when light is present, the species emitted by the eye enables the medium to become the medium of vision. Analogously, the soul cannot be effective without grace (i.e., the agency of the active intellect). When grace is present and the soul is willing, the soul acquires some understanding of God. The understanding of God may be by way of apprehending what grace illumines, i.e., the divine plan qua final cause, or in the case of mystical vision, apprehending the soul itself. The analogy is, I maintain, supported by the emphasis throughout the text on the special nobility and unique status of the sense of sight as an instrument in coming to know.
Footnotes:  Chapter 5


3 Easton, Roger Bacon, pp. 15-17.

4 Ibid., p. 73.

5 Ibid., pp. 45, 58.

6 Ibid., pp. 54-58.

7 In Roger Bacon: The Problem of the Soul in His Philosophical Commentaries (Louvain, 1950). Theodore Crowley suggests that Bacon had some theological instruction both during his tenure on the Faculty of Arts at Paris and afterward at Oxford (pp. 25-30). It is possible that Bacon attended some lectures in the Faculty of Theology, but it is clear from the fact that Bacon did not acquire even a bachelor of theology that whatever training he may have had, he was neither a sophisticated nor rigorous student of theology.

8 Easton, pp. 26, 34.

9 Many of the following ideas are suggested by Easton in his chapter, "Bacon as Friar" (pp. 118-143). Lynn Thorndike, in his discussion of Bacon's life in A History of Magic and Experimental Sciences, Vol. II, p. 620, states that the decision to enter the order was a natural one for the order had many men of learning and supposedly encouraged study in the natural science.

10 For lengthy discussion of Bacon's derogatory opinion of Albert, see Appendix B, "Who Was The Unnamed Master?" in Easton, pp. 210-231. Thorndike includes a chapter on Albert, pp. 517-592, and makes some specific comparison with Bacon in the chapter on Bacon, pp. 638-640, 664, 666, 668, 675, 677). Crowley mentions the animosity of Bacon toward Albert, p. 63.
Thorndike painstakingly examines the grounds for Bacon's self-pitying remarks and lays out the course of adulation and criticism of Bacon, pp. 626-629, 632, 635-637, 675-687. Similar discussion can be found in Easton. Crombie wants to ascribe much of the traditional credit ascribed to Bacon for the development of experimental science to Grosseteste, Grosseteste and Experimental Science (Oxford: Clarendon Press, 1953).


The difficulties of reconstructing the precise sequence of events are carefully treated by Easton, pp. 148-153. He argues that Thorndike's claim that the Opus Majus was almost completed at the time of the letter from the Pope is not as persuasive as the hypothesis that Bacon in fact did little actual work on the Opus until the second communication, Thorndike II, p. 624.


Opus Majus, p. 4.

Ibid.

Ibid., p. 36.

Ibid.

Ibid., p. 49.
Opus Majus, p. 37. The Franciscan emphasis on scriptural exegesis is discussed in Jeffrey, Chapters 2 and 3. For an historical study of the use and variety of scriptural interpretation, see, Beryl Smalley, The Study of the Bible in the Middle Ages (New York: Philosophical Library, 1952). Smalley cites Bacon's primary reliance on scriptures to understand theology, pp. 279-280, 329-333.

Opus Majus, p. 50.

Ibid., p. 66.

Bacon emphasizes the need for careful study of languages in order to avoid error and assure the authenticity to scriptural texts. See, Opus Majus, pp. 105-109.

Opus Majus, p. 576. Smalley argues that this literalist approach to scriptural interpretation follows directly from the instruction of St. Francis, "By a wonderful reversal, the mysteries of the elect means to St. Francis, not the mystical, but the strictest literal understanding of Scripture" (p. 285),

Opus Majus, p. 577.

Ibid., pp. 577-578.

Ibid., p. 52

Ibid.

Ibid.

Ibid., p. 583.

Ibid.

Ibid., p. 585.

This follows from Augustine's position on free will and his notion of body as a tool. See, Chapter 3, pp. 109-112, 120-121.

Opus Majus, p. 116.

Ibid., pp. 116-117.

Ibid.
39 See, Chapter 4, pp. 157, 160-161.
40 Opus Majus, p. 124.
41 Ibid.
42 Various references to the Secret of Secrets are made throughout the Opus Majus, see, for example, pp. 11-12, 63, 65, 621, 628. Further discussion occurs in Easton, p. 73; Leff, pp. 132-133; and Thorndike, Vol. 2, pp. 633-634, 660.
43 See, Chapter 2, pp. 54-59. For the optical geometry of Alhazen consult David C. Lindberg's Theories of Vision from Al-Kindi to Kepler (Chicago: Univ. of Chicago Press, 1976), pp. 71-80.
45 See, Chapter 3, pp. 130-135.
46 Opus Majus, pp. 419-420.
49 Ibid., pp. 189-190.
50 Opus Majus, p. 473
51 Ibid., p. 474.
52 Ibid.
53 Ibid., p. 477.
54 Ibid., p. 481.
55 Ibid., p. 484.
56 Ibid., p. 485.
57 Ibid., p. 492.
58 Ibid.
In like manner that attention of the mind, which fixes the sense on that thing which we see and binds both together, differs by nature not only from that visible thing—it is mind, that is body—but also from the sense itself and the vision, since this attention is proper to the mind alone. But the sense of sight is called a sense for no other reason than the eyes themselves are also members of the body. And though the inanimate body does not experience any sensation, yet the soul, when it is mingled together with the body, does experience sensation through a bodily organ, and this same organ is called the sense.

... These three, therefore, the body that is seen, the vision itself, and the attention of the mind which unites both are clearly to be distinguished from one another, not only on account of the properties characteristic of each, but also on account of the differences in their natures. (McKenna, trans. pp. 317-318.)

De Trinitate is:

59 Opus Majus, p. 510.
60 Matthews, p. 190.
61 Ibid., p. 191.
62 Ibid.
63 Ibid.
64 Ibid.
65 Ibid.
66 Ibid., p. 192.
67 Ibid., p. 193.
68 Ibid.
70 Ibid. p. 194.
71 Ibid. p. 196. The relevant passage from

72 Ibid.
73 Ibid., Opus Majus, p. 471.
74 See, Chapter 5, pp. 252-253.
75 See, Chapter 3, pp. 110-112.
76 Opus Majus, pp. 468-469.
77 See, Chapter 1, pp. 10-11.
78 Opus Majus, p. 470.
80 Matthews, p. 190.
81 Ibid., p. 191.
82 See, Chapter 5, pp. 205-206.
83 Opus Majus, pp. 470-472.
84 See, Chapter 4, pp. 147-148.
85 See, Chapter 4, pp. 148-149.
86 See, Theodore Crowley, Roger Bacon: The Problem of the Soul in His Philosophical Commentaries (Louvain, 1950), p. 83.
87 Opus Majus, p. 462.
88 Ibid., p. 130.
89 Ibid., p. 453.
90 Ibid., pp. 450-451.
91 Ibid., p. 421.
92 Ibid., p. 423.
94 Opus Majus, p. 422.
95 Ibid., p. 423.
96 Ibid., p. 424.
Later, Bacon seems to suggest that magnitude can be inferred from purely geometrical considerations with respect to the visual pyramid (Third Distinction, Ch. 10). However, it seems that Bacon in this later section is concerned with the calculation of the quantity of magnitude, rather than the apprehension of the quality or property of magnitude.

115 *Opus Majus*, p. 501.
116 Ibid.
117 Ibid.
118 Ibid., p. 503.
119 Ibid., p. 505.
120 Bacon does not give any indication here of an indebtedness to the Platonic theory.
121 See, Chapter 3, pp. 86-87, 117-124.
122 *Opus Majus*, p. 578.
123 Ibid., p. 468.
124 Ibid., p. 471.
125 Ibid., p. 445.
126 Ibid., p. 446.
128 *Opus Majus*, pp. 467-468.
129 Ibid., p. 469.
130 Avicenna's Psychology, p. 28.
131 See, Chapter 5, pp. 220-225.
132 See, Chapter 3, pp. 86-88.
133 See, Chapter 3, pp. 88-96.
134 See, Chapter 2, pp. 63-64.
135 See, Chapter 3, pp. 131-135.
136 The development of the theory of the active intellect in Bacon's early work is discussed in Theodore Crowley, *Roger Bacon: The Problem of the Soul in His Philosophical Commentaries*, pp. 182-188, and Leonard

137 Opus Majus, pp. 43-44.
138 Ibid., p. 44.
139 Ibid., pp. 44-45.
140 Ibid., p. 45.
141 Ibid., p. 44. Also, Chapter 2, pp. 66-69.
142 Ibid.
143 See, for example, The Gospel of St. John (1:4-9).
144 See, Chapter 2, pp. 40-41.
145 See, Chapter 2, pp. 70-73.
146 See, Chapter 2, p. 69.
147 Opus Majus, p. 46.
148 Ibid., p. 45

150 Crowley claims that it is in the articulation of the role of the passive reason "Here more clearly perhaps than anywhere else he betrays his fundamental incomprehension of Aristotle's theory of knowledge." p. 167.

151 Opus Majus, p. 45.
154 Bacon claims that Aristotle did not have complete knowledge of the rainbow because he did not know its final cause, i.e., its role in the divine plan. This "ultimate truth" requires divine illumination.
155 Opus Majus, p. 235.
156 Ibid., p. 585.
157 Ibid.
158 Ibid., p. 587.
159 Ibid., p. 578.
BIBLIOGRAPHY


________. Against the Academicarians, trans. Sister Mary Patricia Garvey, Milwaukee, WI, 1957.


______. The Opus Majus of Roger Bacon, Philadelphia: University of Pennsylvania Press, 1928. II.


________. Theories of Vision from Al-kindii to Kepler. Chicago, 1976.


