Aristotle's Theory of Principles: A Rationalistic-Empirical Bipolarity

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ARISTOTLE'S THEORY OF PRINCIPLES
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ABSTRACT

Primarily, this paper attempts to analyze Aristotle's notion of "principle" as it is uniquely applied throughout his works. 'Principle' is a basic notion; and it is, moreover, the basic notion in Aristotle's philosophy. The purpose here is to establish as precisely as possible the meaning of 'principle' and the role that it plays in Aristotelian thought. It is shown that the meaning of 'principle' involves a certain bipolar tension which strains between a logico-epistemic pole and an ontic pole. This tension grounds a philosophy which constantly vacillates between a rationalistic idealism and an empirically oriented naturalism.

The Greek term under consideration is ἀρχή although it should be noted that Aristotle does not always use the term in a technical sense; and, at times, when he refers to 'principle' in a technical sense, he may not always use ἀρχή.

In Chapter I, we claim that Aristotle's basic and primary assumption—that there is a real world which is intelligible—necessarily involves a notion of principles that somehow "connects" the real world with intelligible expressions of it. In other words, "principles" manifest a bipolar condition of being both mental (the intelligible expression) and real (objectively grounded in the world).
Descartes is seen as the first philosopher to challenge seriously the objective pole of principles. For Descartes, philosophical inquiry begins with "principles of knowledge" rather than with "principles of being." The Cartesian assault on Aristotle's "principles" may be unwarranted if it is realized that his (Aristotle's) search after principles of being included the cognitional pole so that "being" is never really separated from one's clear and distinct understanding of it.

Chapter II investigates the bipolarity of Aristotelian principles in the realm of perishable entities. Through his notion of "principles," Aristotle attempts to solve an enigma of "being" and "knowing." How can sensible entities be individual and yet definable, unique and yet intelligible? How can a world of particulars be admitted when "knowledge is of the universal"? "Principles" provide both the concrete unity and the ground for universal understanding in Aristotle's attempt to solve the problem. It is the ontic pole of principles that is explanatory of the concreteness and unity of individuals, while it is the logico-epistemic pole which serves as the basis for universality and intelligibility.

Four specific characteristics of principles as applied to perishable entities are then revealed. Principles are seen to be as: 1) referential or relational; 2) potential for universality; 3) irreducible contraries; and 4) analogous. Concerning the first, principles are to be viewed not as "entities" or "things" but rather as certain ways whereby things are known. The second characteristic pursues in specific detail the problem of
universal knowledge versus individual entities. From the point of view of a being's potentiality, one may realize a universal ground of being many things. From the point of view of a being's actuality, one grasps the individual entity in an immediate sensory awareness. The third characteristic remolds the pre-Socratic and Platonic notions of contrariety. The pre-Socratic notion of archai as contraries (according to Aristotle) cannot be true principles, since being material elements they are not basic and irreducible. Plato's contrary forms cannot be true principles since they are separate from what they purport to explain. Aristotle's bipolar "principles" can be irreducible and contrary and yet be simultaneously "in" things (e.g., act-potency). The fourth characteristic allows both sameness and difference to permeate the various levels of being so that any hierarchy of being is freed from an uncompromising fixity or rigidity. Analogous principles explain a hierarchy of horizontal levels of classes with a vertical continuity running through the class structures (i.e., the genera and species).

In Chapter III, Aristotle's imperishable realm (αὐτοκράτορ) is compared with his sublunar realm. The two realms are seen to be different and yet similar, and it is analogous principles that effect these differences and similarities. Aristotle's application of the same principles to both realms allows him to include both perishables and imperishables under the realm of "nature." This spanning of the whole range of nature by principles warrants a transcendental character of principles that is
contrasted with Aristotle's search in the *Physics* and the *Metaphysics* for a Transcendent One. Again, a bipolarity is indicated which strains between a rationalistic tendency toward a Transcendent Being which might explain the whole of reality and a tendency toward more naturalistic explanations in terms of transcendental principles.

The last Chapter traces the role of principles in the realm of reason where *archai* are applied to Aristotle's theory of demonstration and his general notion of science. Two basic kinds of demonstration are seen as permeating Aristotle's theory of methodology. The first we label "axiomatic demonstration." This is demonstration in the strict sense of deducing certain and necessary conclusions from self-evident principles. These "worthy" and "noble" first principles (*ματά*) are the source of intellectual delight and contain more intrinsic worth than the conclusions that are drawn from them.

The second kind of demonstration is termed "hypothetical demonstration." This is demonstration in a looser sense in which principles are difficult to know and demonstration proceeds from hypotheses and postulates. Conclusions arrived at by means of this type of deduction tend toward probability rather than certitude.

Concerning the problem of how one acquires knowledge of the first principles, we again maintain that Aristotle vacillates between the poles of rationalism and realism. The former pole involves an analytic intuition in which the world of experience is shunned and a mere analysis
of terms and concepts reveals the primary axioms. The latter advocates an inductive intuition in which experience plays a necessary role in one's grasping of the principles.

Finally, it is shown that there is more than one meaning to Aristotle's concept of "science" (ἐπιστήμη).
I. INTRODUCTION

THE PRIME ARISTOTELIAN ASSUMPTION

The reason for our present discussion is that it is generally assumed that what is called wisdom is concerned with primary causes and principles. . . . Since we are investigating this kind of knowledge we must consider what these causes and principles are whose knowledge is wisdom.¹

Thus for Aristotle the highest possible kind of human knowledge is a knowledge of primary principles. Why does Aristotle maintain that human cognition reaches its zenith in grasping principles? Does knowledge terminate in principles or, as the term itself suggests, does knowledge begin with principles? Could one perhaps even venture to say that knowledge begins and ends with first principles? Since Aristotle relates principles to knowledge in speaking of the highest knowledge through primary principles, he implies that principles have a mental or logical expression. One may ask further, then, if principles are merely logical expressions--mental constructs that give meaning to a "reality" that otherwise would be unintelligible; or do principles have a more ontological basis--having as it were a real foundational character? Or again can these antithetical questions be synthesized in an Hegelian kind of dialectic so that perhaps the very same principles of knowledge also serve as principles of being? Furthermore, Aristotle himself raises the question of principles

as axioms of demonstration. Can there even be a science of axioms? If "science" means "knowledge acquired through demonstration," and if demonstration proceeds from first principles or axioms, then would there not seem to be an infinite regress of demonstrating "first" principles by using other "first" principles which in turn would require another demonstration? It is perhaps a difficult task to investigate the "principles" of a philosophical system, since the very object of study precludes any explanation that would be couched in "more basic" terminology than that which is to be described. Yet it would seem that without some understanding of a philosopher's basic starting point, one can hardly grasp the significance of his philosophy. Considering both the difficulty of describing the character of "that which is prior" and the necessity of such a study, one's approach to the problem cannot be direct. The problem must be approached slowly and cautiously, encircled as it were, from all sides not unlike Marcel's approach to philosophical mysteries.

From a linguistic point of view, it may not be clear what a particular philosopher means by 'principle.' The discussion could begin and end at the level of language if the question "what is a principle?" was considered a nonsense question involving a "category mistake" which attempts to reify "principle" when in effect the term merely signifies a basic rule or norm or guide. Such meaning is best exemplified in an expression: "The chief principle of philosophy is to determine the precise meaning of words in a given statement." Even here the word "principle" connotes a beginning of a philosophical position, or a source—a priority—so that the term
is not so nebulous as to exclude understanding. Principle in this sense indicates that: "a proper philosophical attitude begins with . . ." or "a good philosopher starts with . . ." and again, "the source of philosophical clarity is found in . . ." All of this is clear enough, but how would the term be understood if it designates a collection of unproved mathematical axioms that can be used to attain to an understanding of other mathematical truths? For example, principles of mathematics as: if a, b, c are natural numbers, and if \( a = b \) and \( b = c \), then \( a = c \) (Things equal to the same thing are equal to each other). Or, if \( a = b \) and \( c = d \), all letters representing natural numbers, then \( a + c = b + d \) (if equals are added to equals, the results are equal). In these examples of principles of mathematics, the term 'principle' means more than a norm or guideline. It approaches the notion of axiom, indicating a basic unproven and unprovable truth from which other mathematical truths may be derived. And, of course, it is not uncommon to speak of principles of geometry--such as in Euclidean geometry: given any two distinct points, there is at least one line containing them, and at most one line containing them. Here in geometry, we are perhaps dealing with a less abstract subject matter than pure numbers because lines and planes and solids seem to correspond more with doors and walls and table tops than do numbers.

This isomorphic character of "principles" and "things" becomes even more apparent in speaking about principles of physics. To say in Newtonian terms, for example, that every action has an equal and opposite reaction or that a body in motion tends to stay in motion unless an external force
intervenes, is to set the meaning of 'principle' in an even more complex light. When we speak of "principles of moving bodies," are we using 'principles' to denote merely conceptual schemes? If such is the case, if principles are merely conceptual schemes, then why are not "moving bodies" mere conceptual schemes as well? What does it mean to speak of "principles of moving bodies"? We are loathe to attribute reality to principles, yet we are equally reluctant to assign a mere cognitive existence to "bodies." We want to say that "principles" are a conceptual and/or linguistic expression and that "bodies" are real things and in the same breath to speak of "principles of bodies." Now unless "principles" have some foundational character, we could not speak of "principles of bodies." "Principles" is a reference term. It needs the preposition 'of.' In and of itself, it means nothing. By isolating the term in a definition we see the reference character. "Principle:" a beginning (implying a beginning of something to follow); "Principle:" a source (implying a source of something to come); "Principle:" a priority (implying a priority of an impending posteriority). Thus if one wants to retain the purely conceptual character of principles, he does so at the price of existing things. For his principles must then be expressed as "principles of conceptual schemes." These conceptual schemes may, of course, be called "bodies," but is this what the physicist means when he talks about bodies? Is he talking about conceptual schemes, or is his "talking" a conceptual scheme about

2"But we ask what the principle is so that we may refer to something more intelligible." Meta. VII, 1040 b 20. Here Aristotle states that "unity" and "being" are more substantial than "principle" which relates to that which it explains.
bodies--real bodies? And if the latter is the case, is there really any difference between the phrases "talking about bodies" and "principles of bodies," since his "talking" is a basic scheme or source of further utterances about things? If you want to admit that basic expressions are of real things, and if you want to call these basic expressions "principles," then principles have a foundational character. Principles have a nebulous ambivalence between a logical schema and an ontic ground. One need not admit the ontic ground of principles. Principles may indeed be divorced entirely from an ontic reference. But since "principle" is a reference term, it (a conceptual scheme) must be referred at least to another conceptual scheme. "Principles of bodies" in this case is a conceptual scheme of a conceptual scheme. It is "thinking about thinking," or "talking about talking." The basic assumption of Aristotle avoids this "denial" of a "real" world. The merits and demerits of such an assumption shall be subsequently discussed, but it first must be understood that it is the assumption of Aristotle and that it basically involves a particular view of "principles." That there is one basic assumption is clouded by the fact that different linguistic expressions can be given to the same assumption. For example, it is sometimes stated that Aristotle assumes "there is a world." At other times one reads that Aristotle assumes "that the world is intelligible." Now these two statements are really identical because the assumption "there is a world" as soon as it is uttered, immediately engages "the world" in a cognitional frame of reference, thus immediately implying that "the world is intelligible." Furthermore,
if one is not ready to admit that he is "talking about talking," then any further assertions about "the world" must assume that reasons or principles that say something about the world, first (negatively), are not mere conceptual schemes, and second (positively), are real reasons or principles of the world. Perhaps the significance of this view of principles as tied in with a real, intelligible world is seen in better perspective when it is contrasted with its very denial. Then, perhaps, an analysis of the analogous character of "principles" in Aristotle's thinking will cut across his philosophical works and reveal a basic strength and, at the same time, a weakness--taking him at his word that a philosophical view is neither better nor worse than its first principles.

THE CARTESIAN CHALLENGE - A BRIEF HISTORICAL ANALYSIS

Few historians of philosophy will dispute the claim that Descartes represents the beginning of a new philosophical era for he challenged not only an entrenched system of philosophy which supported a theological doctrine, but he also called into doubt the entire scope of human knowledge and submitted the value of cognition to a rigorous scrutiny. For Descartes, philosophical knowledge represented an all-embracing knowledge; so that if he was to tumble the structure of human knowledge in order to build anew, then philosophical knowledge about all must be leveled. But what was "philosophy" to the young Descartes? What did "philosophy" mean to him? Primarily it was Aristotelianism as formulated by the Schools, and the

3Descartes himself distinguishes the philosophy of Aristotle from a
schoolmen had carefully constructed their system upon that which was the very basis of philosophical wisdom for Aristotle--Principles. Philosophy was basically that of Aristotle and Aristotelianism was basically a set of infallible, primary principles. Descartes, therefore, saw need to challenge the validity of these principles if he was to shake the entire structure. It is curious to note that Descartes himself never for a moment questioned the right given to first principles as the basis for philosophy. What Descartes questions is whether Aristotle's archai were the right ones. He (Descartes) accepts, or rather, assumes as a fact that philosophical wisdom is attained through first principles; and his language is not unlike that of Aristotle concerning wisdom in the text from Aristotle quoted above.

...this word philosophy signifies the study of wisdom, and that by wisdom we not only understand prudence in affairs, but also a perfect knowledge of all things that man can know. ...It is essential that it (wisdom) should be derived from first causes, so that in order to acquire it (which is properly termed philosophising), we must begin with the investigation of these first causes, i.e., of the principles.\(^4\)

Descartes, then, never doubts that philosophical wisdom is based on the primary principles, nor does he deny that metaphysics is the prime part of philosophy that deals with the prime principles:

Then when one has acquired a certain skill in discovering the truth in these questions (mathematics) he should begin seriously to apply himself to the true philosophy, the first part of which is metaphysics which contains the principles insists.

"corruption of diverse opinions which he would not recognize as his were he to return to this world." Letter to Abbe Picot used as a preface to Principles of Philosophy (Dover Publications), trans. Haldane and Ross, 1955, p. 207.

\(^4\)Ibid., pp. 203-204.
of knowledge. . . . Thus philosophy as a whole is like a
tree whose roots are metaphysics, whose trunk is physics,
and whose branches which issue from this trunk, are all
the other sciences. 5

Yet for all this apparent agreement between Descartes' conception
of philosophy, philosophical wisdom and the basic role of principles and
that of the Aristotelian view, Descartes will not allow that Aristotle's
principles be the basis of a true philosophy--if for no other reason than
that centuries of futility have proved those principles false.

So, when we have true principles in philosophy we cannot
fail, by following them, occasionally to meet with other
truths; and that there is no way in which we can better
prove the falsity of those of Aristotle, than by pointing
out that no progress has been attained by their means in
all the centuries in which they have been followed. 6

Upon closer examination, one can see the basis for the challenge
that Descartes throws down concerning Aristotle's "principles." In the
above-quoted text from Descartes, we saw that "true philosophy" has for
its "first part" "metaphysics which contains the principles of knowledge."
(Emphasis mine.) In his introduction to the Principles of Philosophy,
Descartes makes it very clear that metaphysics or first philosophy deals
with principles of knowledge.

I likewise published them (The Principles of Philosophy), and
divided the book containing them into four parts, the first of
which contains the principles of knowledge, which is what
may be called the First Philosophy or Metaphysics. 7
(Emphasis mine.)

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5Ibid., p. 211.
6Ibid., p. 214.
7Ibid., p. 212.
It may be no overstatement to maintain that the key to the Cartesian
reconstruction—a reconstruction which ushered in a new critical approach
to knowledge—can be found in this identification of First Philosophy with
the prime principles of knowledge. For Aristotle and the Aristotelian
tradition, Metaphysics or First Philosophy was the "science" that
discovered the principles of being—being qua being. Thus Being is
assumed as intelligible by the Aristotelians; and the intelligibility of
being, that is to say the highest degree of knowledge about being is
brought about by a mental grasping of being's first principles from which
other things can be known.

"The things that are most knowable are first principles and causes,
for it is through these and from these that other things come to be known." The
classical character of Aristotelian principles, however, serves not only a truth
value but an ontic value as well: "They (first principles) are the cause
of the existence of other things, and so as each thing is in respect of
existence, so it is in respect of truth." In this assumption that Aristotle
makes—that there is being and it is knowable—the very existence of
things finds its source (archē) in the same source in which the truth of
things is found. The principles of knowledge are not merely principles
of knowledge but are foundational principles as well. In emphasizing

8Aristotle, Meta. IV, 1003 a ff.
10Meta. II, 993 b 29-30.
the first part of the assumption (there is a world), one makes an ontological commitment which attempts to place being beyond cognitional formulation. ("There is a science of Being qua Being.") Here Aristotle sets the theme for a basic philosophic tendency to distinguish a Being-in-itself from a Being-known. The two views, however, are of the same Being since the principles of the one are also the principles of the other. The ontic tendency of the Being-in-itself view becomes involved in a major difficulty, one perhaps that cannot be fully resolved. Basic principles which are causal and explanatory must take on some logical formulation. And as soon as one realizes that such principles have a logical expression, the ontic in-itself character of Being is questioned. To say that principles of knowledge support an ontology which has the same set of principles looked at from different points of view, so that with a shift of perspective one can distinguish Being from Being's intelligibility, may not solve the problem. For we might ask what that other point of view is in which ontological principles "exist." Is it a point of view apart from cognitional expression? In order to talk about "them," one must involve "them" in cognition; and once involved in cognition, then on what grounds can "principles of knowledge" be distinguished from "principles of Being"? It would appear that any ontology would destroy itself as an ontology (i.e., any attempt to express Being apart from its expression) the very moment that a conceptual formulation is given to it. On the other hand, there is the strongest inclination to deny that our cognitional acts have any ontological effect on things. We want to
say that our knowledge of things does not dictate existence to things. We want to say that things are somehow independent of my cognitional functions. We want to admit that there are things whether or not we know them. This is Aristotle's legacy—a realism that talks about a world shot full of principles whereby things are what they are. There is the notion that Being holds some sort of domination over knowledge insofar as the latter is in a state of passive subservience to the former. Yet Being and knowledge cannot be disconnected for Aristotle. The same principles that explain why things are also explain why things are or can be known. Truth is thus explained in terms of Being.

"This (excluded middle principle) will be plain if we first define truth and falsehood. To say that what is, is not, or that what is not, is, is false; but to say that what is, is, and what is not, is not, is true."\textsuperscript{11}

But is it really that simple? Descartes did not think so—at least the historical disputes that centered around Aristotelianism manifested a complexity that was too entangled for the mathematical mind of Descartes. Descartes sought a simplicity in matters of truth. He looked for the least number of principles that would explain the most. The Aristotelian notion that each science is basically different from another,\textsuperscript{12} and that principles of one science cannot be used to demonstrate truths in other sciences\textsuperscript{13} was a scandal to philosophical inquiry and perhaps

\textsuperscript{11}Meta. IV, 1011 b 26-28.

\textsuperscript{12}Aristotle, \textit{Posterior Analytics}, 87 a 38-40; 87 b 1-5.

\textsuperscript{13}Aristotle makes an exception when the sciences are subalternates. \textit{Post. Ana.} 76 a 10-12.
even the source of so many disputes over things philosophical. Descartes might reason that if principles have such an epistemic priority and an ontic priority, then why is there so much consternation over philosophical issues? Why could not a few basic first principles be discovered that could serve as the foundation for truth in all the disciplines? Perhaps the only way to establish such first principles would be to challenge the basic assumption of an intelligible world. Only in this way could one tell whether or not Aristotle's first principles were genuine or sham. This is Descartes' legacy--to challenge the most basic assumption systematized by the masterful Aristotle. Descartes called into doubt the prime assumption of Aristotle--that there are things. If Descartes was to avoid the confusion and complexity of philosophical issues, then he must avoid speaking of "Beings" as distinct from "knowledge of Beings." There is a world only if a world can be acknowledged, and so Descartes begins his reconstruction with the principles of knowledge. Thus the Cartesian Metaphysics or First Philosophy "contains the principles of knowledge."

Generally speaking, no one prior to Descartes questioned the bipolar character of principles (i.e., the ontic and epistemic). If one accepts the usual historical evaluation of Stoic and Epicurean thinking as being predominantly ethical, then any ontological-epistemological contributions can be dismissed as having no great influence on future philosophers in this area. Alexander of Aphrodisias evidently "freed" Aristotle from Neo-Platonism, but he need not have worried about Plotinus' philosophy.
concerning the basic assumption of a principle of Being distinct from and yet the cause of knowledge. The One of Plotinus has to be apart from thought since thinking implies object-thought, and hence there would be a manifold which would contradict the perfect unity of τὸ ζυγ. 14

"Principle is above all else. The whole is like a conclusion of a syllogism, only without premises--beyond demonstration." 15 And again, "Being and Actuality are identified in a single principle which depends on itself and nothing else." 16

Proclus, whom E. R. Dodds considers as the chief link between ancient and medieval thought, 17 accepts much of Aristotle's philosophy, not the least of which is a self-sustaining archē which gives being to all things and which is apart from and the cause of knowledge. 18 Now we are not necessarily claiming that Aristotle influenced Neo-Platonism by distinguishing the realm of Being from the realm of thought. 19

14 Plotinus, Enneads V, III 6.
15 Ibid., V 8.
16 Ibid., VI 8.
18 Ibid., Proposition 20, p. 22.
19 Aristotle does separate, of course, sensible substance from eternal substance. In Book XIII of the Metaphysics, he contends that neither Platonic Ideas nor Pythagorean numbers as separated substances can explain (as principles) sensible, perishable objects. Aristotle is not opposed to the concept of separated substances--surely he himself has enough of them. Nor is he opposed to the notion that separated substances can be the causes or principles of sensible objects, for he also has such principles. What he does maintain in Book XIII is that 1) neither Ideas nor
Aristotle's insistence on the actual knowledge of particular things denies any separate realm of intelligibility. What Aristotle did—as we have indicated—was to endow principles with a dual (ontic-epistemic) character. Our point now is that no Neo-Platonist saw need for challenging this endowment and, in fact, each philosopher fit it very nicely into his own particular philosophy.

In medieval philosophy there is something of a challenge offered to the Aristotelian assumption of a "real world" when the status of universals is disputed. Nominalism and conceptualism foreshadow the Cartesian revolt against the domination of Being over knowledge. In the end, however, it is "modern Realism" that triumphs over both nominalism and conceptualism so that universal ideas "exist" in mente formaliter, cum fundamento in re. Mental (formal) existence is second best to the foundational reality of things, and truth becomes the adeguatio intellectus et rei. This formula clearly expresses the distinction between logical truth (the truth of the conceptual judgment) and the ontological truth (the truth of things themselves); of course, logical truth is possible only because of the ontological truth of things. And, equally important, this notion of truth is possible because principles somehow bridge the gap between the real and the ideal. In the Thomistic commentaries, the basic Aristotelian assumption reaches its complete fruition. Aristotle is the philosopher. Garrigou-Lagrange adequately summarizes the role that principles play in a philosophy which assumes that the world is intelligible.

Numbers can exist apart from sensible substances, and 2) they cannot explain sensible things (i.e., cannot be principles).
In the intelligible reality thus known, our intellect seizes at once its opposition to non-being, and an opposition expressed by the principle of contradiction: Being is not non-being. "By nature our intellect knows being and the immediate characteristics of being as being, out of which knowledge arises the understanding of first principles, of the principle, say, that affirmation and denial cannot coexist (opposition between being and non-being), and other similar principles." Here lies the point of departure in Thomistic realism. 20

Thus Being qua Being has a philosophical primacy, and all knowledge must "conform" to being if that knowledge is to be true. This assumption of an intelligible world may not be so easily dismissed. It was already mentioned that some sort of mental submissiveness to "reality" is a tendency quite in accord with common sense, and Aristotle has indeed been credited with a common-sense approach to philosophy. However, there is a danger that may arise when the assumption of a real world is based on a set of fixed principles that will not allow the "assumption" to be modified or changed for the purpose of discovering some new aspect of reality. There certainly does not seem to be anything wrong with taking "being" as one's starting point. One needs some starting point—an arché—and it might as well be something rather than nothing. But once it is realized that such an "objective" beginning has an immediate "subjective" (conceptual) formulation, then the assumption must grow so that the conceptual expression, in some way, is the same as the "objective something." It is precisely here that the bipolarity of first principles enters into the Aristotelian assumptions. It will be our

task now to investigate specific Aristotelian texts to determine what may be considered the strength of a "first principles" philosophy and also what may be weaknesses due to the very same first principles.
II. PRINCIPLES AND THE REALM OF "PERISHABLES"

PART I - THE RELATION OF PRINCIPLES TO THE REALM OF "PERISHABLES"

If we begin our investigation of principles with Aristotle's problematic approach to Being,\(^1\) we notice that some of the aporiai deal with principles in relation to methodology, science and/or demonstration, Being and Knowledge. Of those problems that involve the Being-Knowledge relationship of principles, three in particular seem to involve a common answer:\(^2\) 1) aporia VI--Are the first principles ultimate genera? 2) aporia XI--Are the first principles universal or like individual things? 3) aporia XII--Do first principles exist potentially or actually? In developing each problem in detail in *Metaphysics* III (Beta), Aristotle expresses the puzzlement concerning the nature of principles. In the light of his prime assumption, he wants principles to be of things; but "things" are individual. But individuals are explained in terms of genera and species and differentiae which are universals and hence conceptual. What, then, is the status of principles--real, in the sense of having an individual character, or ideal, in a universal sense? If real (individual), then how can principles explain anything? If ideal (universal), then how can they explain individuals?

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\(^1\)Meta. III, 995 a ff.

\(^2\)The Roman numerals are the numerical values assigned to the aporiai in the Loeb edition, 995 b 26; 996 a 10; 996 a 12.
Aristotle poses the problem of the genera status of principles in two ways. Perhaps we can reformulate the problems by means of two dilemmas:

If first principles are elements of individuals, then they are not genera. If first principles explain and define individuals, then they are genera. But the principles cannot both be genera and not be genera at the same time.

Therefore, first principles cannot be elements of individuals and at the same time define individuals. ³

Aristotle then shows a preference for assuming that first principles are genera and not elements of individuals. He speaks of elements in a pre-Socratic sense and tentatively rejects the term since elements can be broken down quantitatively and thus cannot be primary. Hence, there is the second dilemma which tries to assume that first principles are genera:

If first principles are genera, then they are the highest genera (first principles must be predicated of all). If first principles are genera, then they must be the lowest genera (that which is more pertinent to the individual best explains the individual).

But they cannot be the highest genera (for then Unity and Being would have nothing to differentiate within a genus), nor can they be the

³Aristotle does not use the dilemma form. His formulation of the problem can be found in Metaphysics III, 998 a 20-30.
lowest genera (for how can a principle exist apart from an individual—which a principle must be able to do).

Therefore, first principles cannot be genera.\(^4\)

In Aristotle's complex discussion of the problems surrounding the character of principles, there seems to be little question of the perplexity that confronts him. How can principles mediate between a real world of individuals and the conceptual understanding of that world? The commitment to an intelligible world has its problems. This basic tension seems to permeate Aristotle's writings. Principles are invoked to explain individual things; as such explanations they (principles) have a conceptual and somewhat universal character; as explanations of things, however, they should have some kind of "extra-mental" and hence individual status.

Concerning the more specific problem of first principles and the genera, Aristotle attempts to resolve the difficulty first when he considers the relationship of substance (ousia) to universals.\(^5\) Aristotle is reluctant to allow any universal term to be a substance since 1) substance is of an individual peculiar to a "this" and no other, whereas "the universal is common;" 2) substance, because it is a substance, cannot be predicated of a subject, while the universal is always predicated of a subject.\(^6\) Aristotle concludes these passages with the warning that

\(^4\)Meta. III, 998 b 15-35; 999 a 1-15.

\(^5\)Meta. VII, especially Chapters 10, 12, 13; cf. also Topics 128 a ff.

\(^6\)Meta. VII, 1038 b 1-35.
unless one wants to risk becoming involved in a "third man" argument, then "no universal attribute is substance." It seems fairly certain that Aristotle argues against the endowing of substance with universality in order to preserve the uniqueness of a real world of individual entities. But as soon as he denies a universal attribute of substance, he foresees the difficulty. If substance includes no universal attribute, it can contain no formula (logos); and if it contains no formula, there can be no definition. But if substance cannot be defined, then nothing can be defined, since it was shown that "substance is the only or chief subject of definition."\(^7\) Aristotle then executes his classic philosophical dodge that in a way gives a clue to his impending "solution." He states that after all in one sense things may be defined and in another sense may not. He then promises to clear it all up later.\(^8\)

Before pursuing further Aristotle's answer, it might be well to recover some ground and also to anticipate his answer in order to put the problem into better perspective. The question "Are the principles ultimate genera?" raised the problem of individual entities understood in universal terms. The difficulty revolves around and is couched in the terms of the traditional one-many enigma that Aristotle inherited from the pre-Socratics and Plato. Ousia—(substance) is the term Aristotle chooses to designate individual entity\(^9\) and as we saw, he

\(^7\) Meta. VII, 1039 a 19.

\(^8\) The problem and its "solution" are treated again in Book VII 15 and Book VIII 6.

is groping to explain the knowledge of such entities through universal explanations. Will the Platonic universal Ideas of Unity and Being provide such an explanation? Aristotle does not think so. Once he has committed himself to the notion of substance as a basic entity-category, then it serves no conceivable purpose to call in a separate "entity" of unification. Substance has all the unity it needs and is in fact the primary sense of being. To attempt to "tie" substance together with some kind of participation in an Idea-Entity runs the risk of a third-man argument. Aristotle's starting point in an investigation of Being qua Being is with the real world of sensible entities (substances); and in order to save the assumed intelligibility of the world of entities, he introduces his unique concept of "principle." Principles are to save the intelligibility by providing universality, without, at the same time, destroying the uniqueness of individual entities. In fact, far from destroying individual uniqueness, principles are to explain it—all the while, of course, they also explain universality. Aristotle will try to maintain that his "principles" preserve the individual entities as a basic unit in and of themselves because principles are not entities in and of themselves (at least principles of sensible substances are not). Hence there is no danger of a third-man regression. Secondly, principles are to afford the common bond of universality that makes individuals intelligible. Perhaps the most significant statement in the Aristotelian texts that highlights the

10Meta. VII, 1028 a 15; IX, 1045 b 25.

11Aristotle never denied the Platonic insistence that true knowledge in some way attained the universal status.
relational character of principles, along with their explanatory function is the one quoted above: "We ask what the principle is so that we may refer to something more intelligible."  

In formulating in more detail the last aporia in Book III (i.e., whether principles are universal), Aristotle summarizes the second part of the difficulty. "If on the other hand they (first principles) are not universal, but like particulars, they will not be knowable, for the knowledge of everything is universal."  

Aristotle will then try to show that individual substances are unities of principles—that actuality and potentiality, matter and form, as principles, constitute the basic unity of substance—and as dual principles manifest in substance and through substance the one-many tensions of change and stability, unknowable and knowable, and ultimately of non-being and being. Even when Aristotle applies his principle-solution, the tensions and paradoxes remain, or perhaps one should say that they remain because of the Aristotelian solution. There will always have to be a shift in one's point of view—from principle as universal explanation to principle as ground of real individual entity. Individual things can be defined from one point of view and will be undefinable from another. Knowledge is universal in the sense of dealing with universal principles (a potential application

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14 In the non-being—being category, non-being is the potential aspect of changing entities rather than an absolute nothing. Aristotle criticizes Plato for not conceiving non-being as a potential substrate in things. cf. *Meta.* XIV, 1089 b 15–30.
to all individuals); and, again, knowledge is not universal in the sense of actually knowing the individual. In dealing with sensible substances in the *Metaphysics*, Aristotle substitutes "principles" for Platonic Ideas and Pythagorean Numbers, with his "principles" serving as the inherent explanations of particulars.

The Platonists are chided by Aristotle for trying to explain a multiplicity that stands apart from a primary unity. Aristotle asserts that they (the Platonists) should also have asked, "How is it that relations are many and not one?" and "He (Plato) should ask how is it that things in general are many?" Aristotle's own starting point—as his prime assumption implies—was with the intelligible world of "the many." This latter realm may rightly or wrongly need an ultimate One to complete the Aristotelian system, but he prefers to begin with the more common-sense approach.

Now, perhaps, we are better prepared to return to Aristotle's attempt to have his multi-faceted principles explain how sensible entities (substances) can be unique and yet definable; particular and yet intelligible.

In the *Metaphysics* Aristotle distinguishes substance which is the concrete (*synolon*), sensible entity having the formula (*logos*) combined with matter from substance which is "formula in the proper sense." There is no need to assume that Aristotle is speaking of eternal substances in

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15 *Meta.* XIV, 1089 b 9 and 25.

the latter case. He is apparently referring to our conceptual grasping of what is definable in individuals for he mentions as an example "the essence of house" which, as such, is not generated; rather, it is the "essence of this house" that admits of generation and destruction. Aristotle concludes from this distinction that there is no definition nor demonstration of individuals17 since these "perish" and do not manifest the stability and necessity required by definition and demonstration. The principle of individuals that prevents their being defined is the material or potential aspect. This is so, Aristotle maintains, because matter is "indeterminate," a principle of change, and hence the reason for a sensible entity's affinity for "otherness."

"For this reason there is no definition or demonstration of particular sensible substances, because they contain matter whose nature is such that it can both exist and not exist."18 Earlier in Book VII he writes: "There is no formula involving the matter, for this is indeterminate."19

Shifting from the negative aspect of what a definition does not involve to a positive view, Aristotle wants to claim that the definition does involve the "indwelling form" which is substance in the primary sense.20

"And when they (individuals) have passed from the sphere of actuality it is uncertain whether they exist or not, but they are always

18Meta. VII, 1039 b 32.
19Meta. VII, 1037 a 28.
20Meta. VII, 1037 a 29. cf. also De Anima 403 a 25 in which Aristotle speaks of the "in mattered forms" (logoi enyloj).
spoken and apprehended by the universal formula. But matter is in itself unknowable."\textsuperscript{21}

It seems that Aristotle presumes the form to be the same in all individuals that are thus grouped in a class and defined according to the form, and in this form (eidos) is the ground for the necessary universality in definition.\textsuperscript{22}

But, perhaps, this begs the whole question of the unity in an individual entity? And how does Aristotle himself avoid a kind of participation theory? If he explains away the difficulty of giving universal definitions of indefinable singulars by positing two inherent principles, then what unites the principles into one individual being? Might it not seem that Aristotle himself is guilty of a tritos anthropos argument? He claims not.

Evidently if we proceed in this way (i.e., to explain unity through a Platonic participation in separate Ideas), it will be impossible to answer and solve the difficulty. But, if, as we maintain, man is part matter and part form—the matter being potentially, and the form actually man—, then the point which we are investigating will no longer seem to be a difficulty.\textsuperscript{23} (Emphasis mine.)

\textsuperscript{21}Meta. VII, 1036 a 8-9.

\textsuperscript{22}The question of finding universality in the individual's eidos in Aristotle's writings is highly debatable. Parker and Veatch admit that it is only implied in Aristotle but spelled out more clearly in Avicenna, then developed more fully by Aquinas. Randall denies that Aristotle ever intended a scholastic notion of "abstraction." In addition to the passages cited above (footnotes 20 and 21), confer with Posterior Analytics 71 a 26ff. in which it is implied that one can know the universal without having to grasp all the particulars that fall under it. Also confer with Aristotle's description of induction, Posterior Analytics II, 19.

\textsuperscript{23}Meta. VIII, 1045 a 22-26.
In the Aristotelian explanation, then principles are "parts" of the whole thing and not whole things themselves. But, again, an objection might persist: Do not "parts" need another unifying aspect in order to render the whole intelligible? Aristotle would answer "Yes" to this question if the "parts" were physical, i.e., elements (stoichea); but such is not the case. For Aristotle, elements are "things in their own right" into which other things are divided, whereas principles are irreducible aspects of the one individual thing. "Substance (i.e., eidos, formal principle in this passage) would seem to be the 'nature' which is not an element but a principle. An element is that which is present as matter in a thing and into which the thing is divided."24

In this view of principles, as irreducible aspects of the one individual entity, you cannot divide the principles from the thing nor can the principles actually be divided from each other. In fact, principles are simply different views of the same thing. Man, if he is a perishable entity, is a fulfilled capacity—an actualized possibility. The individual man is not a pure eidos, but a formal organization of "something" capable of being formed and whose capacities constantly resist form (i.e., the individual is perishable).25

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25Aristotle, like Plato, has a notion of matter as that which resists form. The basic difference between the Platonic and Aristotelian "solutions" is in the former's "separation" of the Forms from that which resists it and the latter's "combination" of the two aspects in one individual caught up in an inherent tension. Aristotle seems to allow for a dynamic view of reality by locating the aspects of order and resistance in the same entity.
In fact, if the proper distinctions are made, the principles, in a sense, can be identified. It can be said, for example, that the matter is the form—potentially, and that the form is the matter—actualized. The shift from one principle to the other is made only because the one individual manifests such dual aspects. There is an actual man who is potentially many things (at least he is open to a multiplicity of temporal moments—he is enduring). Thus both aspects of being—actual and possible—are at the same time inherent in sensible individual entities; and there is no need to look beyond individuals for another unifying principle or Idea or Cause.

"What then is it—apart from the efficient cause—that causes what exists potentially to exist actually in things which admit of generation? There is no other cause of the potential sphere's being an actual sphere; this was the essence of each."26

And again:

People look for a unifying formula, and a difference between potentiality and actuality. But as we have said, the proximate matter and the shape (morphē) are one and the same; the one existing potentially, and the other actually. Therefore to ask the cause of their unity is like asking the cause of unity in general; for each individual thing is one, and the potential and the actual are in a sense one.27

There is a sense, then, in which the actual and the potential are one; and it is through the unity of these principles that Aristotle hopes to solve the dilemma concerning the demands of universal knowledge in

26Meta. VIII, 1045 a 30-34.

27Meta. VIII, 1045 b 20-23.
the face of individual entities. What one actually knows is that which actually is—the individual (i.e., actual cognition is of the individual entity). However, as it was seen, the actual individual—being a sensible and perishable entity—contains within it potentiality which is the ground for a knowledge of many things. As knowledge of individuals is to actuality, so knowledge of universals is to potentiality; and since actuality and potentiality are in a sense the same, so knowledge of individuals and knowledge of universals is in a sense the same. The expression "in a sense the same" implies that every individual act of cognition has as its object an individual in which is contained the ground for universality.

The doctrine that all knowledge is of the universal and hence that principles of existing things must also be universal and not separate substances, presents the greatest difficulty of all that we have discussed; there is however, a sense in which this statement is true, although there is another sense in which it is not true. Knowledge, like the verb "to know" has two senses, of which one is potential and the other actual. The potential being—as matter—universal and indefinite, has a universal and indefinite object; but the actuality is definite and has a definite object because it is individual and deals with the individual... it is clear that although in one sense knowledge is universal in another it is not. 28

Finally, we are in a position to return to the problems of whether or not principles are genera, whether principles are particular or universal, whether principles are actual or potential. The latter two problems are answered more directly in the quotations cited above. Principles are both

28 Meta. XIV 1087 a 12-25.
particular and universal, and principles are both potential and actual according to one's point of view. Concerning the problem of the genera, Aristotle never directly answers his question although, perhaps, some inferences can now be made. The first dilemma that was formulated above could not be resolved if principles were genera and at the same time principles of individuals. There seems to be no problem now since the principles of individuals contain the ground for universal (generic) expression. The second dilemma would not allow principles to be both the highest and lowest genera. But, now, principles are both the highest (universal) and the lowest (individual) at the same time and in the one same entity.

Following Aristotle's classic expression, we can now say, perhaps, that principles in one sense are genera and in another sense are not. They are not genera inasmuch as they are principles of individual entities ("real" principles). They may be considered genera insofar as they are involved in universal definitions of a mental character (conceptual principles).

This reveals a further character of Aristotle's "principles." They are both "real" and "ideal." The principles of Being are also principles of knowledge. That principles should thus vacillate between being a ground of entities and a conceptual expression is exactly what the basic assumption of Aristotle demands. Real, actual, individual entities are mind related. Being is intelligible.
Summary and Critique

An investigation of the relation that Aristotelian principles bear to being and knowledge was begun by examining certain aporiai in the Metaphysics. It was claimed that Aristotle's desire both to begin philosophy with what common sense tells us is real (viz., the sensible world of individuals) and also to explain the "highest forms" of knowledge in terms of universality and necessity demanded a reality that was somehow unified through principles of a protean character. The matter and the form of individual entities are but the potential and the actual manifestations of the one changing entity. By beginning with the manifold of experience in order to explain the unity of knowledge, Aristotle departs from the Platonic approach whereby unique and separate Forms are somehow superimposed upon an enduring "world." In the light of this basic difference, it is not a little surprising when some philosophical scholars suggest that "Plato's pupil" is just as Platonic as Plato. George Boas, for example, states that Aristotle's "separated substances" prevent him from any claim of being an empiricist; and Boas further maintains that it is due to Hegel's dialectical influences that Aristotle has been considered the "antithesis" of Platonic philosophy.

They (eternal and immutable substances) are as separate as any Idea of Plato's. Consequently, to classify Aristotle as an empiricist is extremely misleading, since we have his word for it that no knowledge is possible of what modern philosophers call experience. . . . But since the time of
Hegel it was thought necessary that Plato's pupil provide an antithesis to his master's philosophy. 29

First of all, while it is true that Aristotle concludes with eternal substances that are as "separate as any Idea of Plato's," it remains to be seen how this would exclude the possibility of an analogous kind of necessity-principle inherent in and explanatory of the sensible world of individuals. Not only did Aristotle claim this latter world to be real (actual) and intelligible, but this is precisely where he begins his investigation of being qua being. Boas urges us to read the text of Aristotle, yet almost the entire Books XIII and XIV are a criticism of any attempt to allow separate Ideas and Numbers serve as explanations of physical, individual beings. Furthermore, as it was stated above, the very approach of Plato is challenged by Aristotle: "They (Platonists) should have asked how is it that relations are many and not one." 30 Aristotle even attempts to show why Plato could not bridge the gap between the Ideals of Being and Unity on the one hand and a manifold on the other. He claims it was due to Plato's failure to recognize in the changing sensibles a non-being that is a potency-substrate. 31

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29 George Boas, Some Assumptions of Aristotle, transactions of American Philosophical Society (Philadelphia, 1959), p. 79. F. Solmsen had made an earlier claim that Aristotle's entire theory of archai grew out of Plato's doctrine of hypothesis in Republic VI-VII and that basically there is little difference between the two. cf. Die Entwicklung der Aristotelischen Logik und Rhetorik (Berlin, 1929). This view is disputed by Ross.

30 Meta. XIV, 1089 b 8.

31 Meta. XIV, 1089 b 16-30.
Secondly, Boas' charge that in Aristotle "no knowledge is possible of what modern philosophers call experience" merits comment. Boas seems to be basing this criticism on an earlier statement in which he (Boas) writes: "There is no knowledge of individuals, says Aristotle in the *Metaphysics* 1003 a 13."\(^{32}\) The general passage in Aristotle that is referred to by Boas is the third Book of the *Metaphysics*—the *aporiai*; specifically, it is the last problem posed in which Aristotle says that if principles are universal, then how can there be knowledge of universals since *all knowledge is of the universal?*\(^{33}\) (Emphasis mine.) Aristotle is not dogmatically stating that "all knowledge is of the universal." He is posing what he considers to be a legitimate problem when he realizes that knowledge tends to be structured for universal concepts while reality consists of particular beings.\(^{34}\) It is this precise problem that Aristotle thought he solved by realizing, through unifying principles, a universal ground in sensible reality.

Principles are and are not genera, depending on how they are realized. Conceptually, they admit of a universal formulation; concretely, they are never separate from physical entities. Also, even after Aristotle has allegedly solved the problem (especially in 1039 b 29), he never states that individuals cannot be known. To do so would be to deny his prime

\(^{32}\)Boas, *op. cit.*, p. 45.  
\(^{33}\)Meta. III, 1003 a 13.  
\(^{34}\)Aristotle applauds Socrates for realizing that although definitions need universal concepts, he did not separate universality from particulars. cf. Meta. XIII, 1086 b 1-5.
assumption. What he does say is that individuals as such cannot be defined or demonstrated. The terms 'definition' (orismos) and 'demonstration' (apodeixis), which are used together three times within eight lines, designate a specific mode of knowledge which is attained only after the individual has been in some way generalized. \(^{35}\)

To be sure, this Aristotelian knowledge of individual, physical entities need not make Aristotle an empiricist in the modern sense of the term. It is true, however, that Aristotle is usually referred to as a realist. \(^{36}\) Empiricists can also be called realists, but certainly Aristotle's "empirical" approach to reality is more of a gross observation compared to the experimental analysis of the modern empiricist. If he (Aristotle) is a realist, then he is an Aristotelian realist in the same way that Plato is a Platonic idealist and Hume is a Humean empiricist. In other words, it would certainly seem that an authentic philosopher is a philosopher sui generis.

Aristotle is certainly more than simply "Plato's pupil." Plato's influence is surely felt. Perhaps what Aristotle designates as "Being qua Being" may also be a separate, immutable and eternal substance; \(^{37}\) but

\(^{35}\)Meta. VII, 1039 b 29-37.


\(^{37}\)The hermeneutical question surrounding Being qua Being as the subject matter of the Metaphysics seems to raise an almost endless controversy. Does Aristotle intend that first philosophy should study the universe as a whole, or is "Being" to be taken in a distributive sense in
even if this is so, Aristotle's own concern with principles of nature (the sensible world) distinguishes him from his Platonic heritage.

Part II--The Character of Principles in the Realm of "Perishables"

In Part I Aristotelian principles that related to Being and Knowledge in the realm of "perishables" were considered, and it is hoped that Aristotle is established (thus far at least) as an Aristotelian rather than as another Platonist. This claim for the uniqueness of Aristotle's philosophy rests mainly in his acknowledgment that the sensible world of changing entities carries within itself its own reason (principles) for being--and--being known. To be consistent with this view (which we expressed as the basic assumption of Aristotle--the notion of an intelligible world), the "principles" must have certain characteristics or traits which set them off from previous explanations of the world. 38

which any individual being is studied insofar as it is. (Ross formulates this problem in his commentary on the Metaphysics Vol. I, p. 251.) Perhaps the problem is even more complex than as Ross states it. Considering Being qua Being just in its distributive connotation, one might ask whether Aristotle is considering individual things as conceptually unqualified in virtue of their existential status. Such a consideration would perhaps involve an ontological commitment which could be expressed by the ens commune formula. On the other hand, Being qua Being (still in a distributive sense) could mean that "part" of an individual being--any being--that is independent of matter and change, separate substance that is most like the Divine. This consideration of Being qua Being classifies its object--separate substance--and does not have the pervasive, ontological significance. This latter interpretation of Being as primarily separate and Divine substance is held by Owens (fn. 9).

38 In order to understand Aristotle's notion of "principle," we must consider his philosophical doctrines in their historical setting. His "principles" are explanations arrived at after a consideration and rejection of pre-Socratic "elements," Pythagorean "numbers," and Platonic "forms" as basic explanations of why the world is the way it is. His own basic
"Principles," thus far considered as principles of perishable entities, have the following characteristics: 1) referential; 2) universally real only in a potential sense; 3) irreducible in a given line of thought; 4) analogous, inasmuch as "sameness" and "difference" are rooted in the principles themselves.

The Referential Aspect of Principle

First of all, in labeling Aristotle's principles as "referential," we must add certain qualifications. Only "perishable" entities have so far been considered in the "Science of Being qua Being." He himself reminds us several times in the Metaphysics that, strictly speaking, natural philosophy is the discipline that properly studies perishable (changing) beings. However, he feels that a prior consideration of changing entities is requisite in order to arrive at a proper understanding "answers" are called "principles," the character of which we shall now examine. It may well be impossible to consider Aristotle's philosophy in any other context except the historical frame of reference in which he set down his thoughts. Attempts are still made, however, to extract his philosophy from the development of thought and give it a kind of semper et ubique character. Even in areas of the physical sciences in the face of modern physics, one finds attempts to deploy Aristotelian "physics" as valid "explanations" which hold true of nature regardless of any new scientific discovery. (cf. V. E. Smith, The General Science of Nature (Milwaukee: Bruce Publishing Co., 1959) Many times this is done in the name of "perennial philosophy" whereby it is implied that a philosophical system validly escapes the historical condition and offers the perennial answer in spite of new problems. My feeling is that if "perennial philosophy" means anything it indicates the reverse of this view, viz., that reality has more or less presented similar problems to philosophers of any age, but once an attempt is made to state or solve the problems--once a particular philosopher sets his thoughts down--his philosophy is immediately colored by the peculiar circumstances of the age. There is value in this "perennial" approach insofar as past philosophies serve as an aid in formulating new approaches. "Perennial philosophy," in my opinion, should mean nothing more than this.
of Being qua Being. It was mentioned above that this latter expression may mean for Aristotle that Being's "primary instance" (ousia) is separate and eternal. On the other hand, Being qua Being may mean that our understanding of things involves a common bond of individual realities with no special reference to any one being. Whatever it may mean, a great portion of Aristotle's Metaphysics concerns itself with the familiar world of changing things. It is not until Book XII that eternal and immutable ousia is unmasked as the raison d'être of all, and it still remains to be seen whether such ousia is a "principle" with an entitative thing-in-itself character or not. In the realm of perishables, however, his principles are purely referential. Principles are explanations of --. "We ask what the principle is so that we may refer to something more intelligible."39 From an epistemological point of view, principles may be considered as rational schemes of understanding (through principles we come to know individual things). On the more ontological side, principles are but modes of being—or aspects or whatever term may best convey the notion that while 'real' may never be properly predicated of principles, yet individuals really manifest certain modes or characteristics (through principles we come to know individual things). It is the individual entity which is real; and for Aristotle, the individual's reality is grounded in a principle of actuality which is simply one's understanding of what a thing is as opposed to what a thing may become. The actuality-potentiality principles are not "things" themselves. This is not to say, however, that

"principles" are purely conceptual. The unique puzzle surrounding the whole notion of Aristotle's principles seems to lie in their partaking of both the conceptual and the real state of affairs. It seems unlikely that Aristotle himself saw the difficulties involved in trying to determine the status of his archai. The archai are not physical; they are not purely logical; they are not completely independent of thought; they are not solely dependent upon thought. What, then, are "they"? Some might say "metaphysical," but that is not Aristotle's answer. In fact, to attach that label to Aristotle's principles brings only more problems, especially the "occult cause" charge leveled against medieval interpretations in which Aristotle's principles-as-ground (i.e., fundamental understanding) become principles-as-cause. For example, some scholastic philosophers talked about the "substance" as being the "cause" of the accidents; or "potentiality" as being the "cause" of change; and "actuality" as being the "cause" of existence. Such "causes" might well be occult. What Aristotle most likely intends by his archai theory is a compromise which grew out of his criticisms of pre-Socratic cosmology and Platonic epistemology. The archai of the former were material and, therefore, according to Aristotle, not the basic structure since a further division would always be possible. 40 Plato's archai (Forms) carried the necessary

40 Aristotle's general criticism of the pre-Socratic archai (especially Meta. I, 3) revolves around their making a magnitude a basic principle. For Aristotle "material magnitude" and "principle" are incompatible terms. Nor would he allow the Pythagoreans to have "numbers" as inherent archai of bodies: "that bodies should be composed of numbers, and that these numbers should be mathematical is impossible. For a) it is not true to speak of indivisible magnitudes; b) assuming that
credentials for true understanding but were separate from the very explicanda. Principles as referential are an attempt to compromise these two views: he admits with pre-Socratic thought that archai are inherent in physical things, but denies that the basic archai are physical inherents. He admits with the Platonists that archai render things intelligible, but denies that they exist apart from intelligible things. Principles, therefore, are neither in things nor apart from things; principles are of things, i.e., principles are relational or referential. It is a noun-obsessed language that would make "principles" into things, reifying principles into "its" and "theys." In addition, when "principles of" (as ground) become "inherent causes of," then the occult cause charge is warranted. Hence bodies fall, not because of any attraction between masses which is mathematically measurable; but, rather, they fall because of a potency to fall. It may well be that certain passages in Aristotle lend themselves to such an interpretation, and in those cases Aristotle's "principles" may be just as "occult" as those of some of the medieval interpreters. Aristotle seems to have suffered from the same linguistic difficulties that plagued Plato who vainly sought to "locate" ideal entities the very nature of which excluded any location. At any rate, the bulk of Aristotle's linguistic testimony concerning "principles" serves this view is true, still units have no magnitude; and how can a magnitude be composed of indivisible parts?" Meta. XIII, 1083 b 12-14.

41 cf. Physics VIII, 255 b 31-35. Aristotle distinguishes "natural motion" from "accidental motion" and, in the former case, nature itself is the "cause" of motion.
this valuable end: it links man with the world and it is "principles" in their referential character that primarily achieves this end. This is why, perhaps, William James will feel no embarrassment in calling Aristotle one of the precursors of Pragmatism and yet state as a basic attitude of Pragmatism that it must "look away from principles." The Aristotle that James knew was a realist in the only way that the historical Aristotle could have been a realist. At all costs, the intelligibility of the world had to be saved even if the expression of this world's intelligibility (through principles) gave rise to the possibility of occult entities. In many ways, Peirce and Aristotle share in the same kind of realism. Peirce seems to make the same basic Aristotelian assumption and also talks about "characters" of reality "entirely independent" of our opinion—all of this with no fear of an "occult entity" charge. Witness the following quotation from Peirce with my emphasis added:

Such is the method of science. Its fundamental hypothesis, restated in more familiar language, is this: there are real things, whose characters are entirely independent of our opinions about them; those realities affect our senses according to regular laws, and, though our sensations are as different as our relations to the objects, yet by taking advantage of the laws of perception, we can ascertain by reasoning how things really are.  

42James, op. cit., pp. 45 and 47.

The Character of "Principles" in Relation to the Universality of Knowledge

There are many instances in the writings of Aristotle in which he declares that "knowledge is of the universal."[44] This assertion presents an especially puzzling problem in the light of any claim to make Aristotle a realist in touch with a world of "particulars" through "principles." The problem centers around the precise meaning of the statement "knowledge is of the universal." Surely in assuming this character of knowledge, Aristotle would not want to claim that knowledge involves a confrontation with "universal entities" existing apart from particular things. On the contrary, as he himself states, this "separation of the universal is the cause of the difficulties which we find in the Ideal Theory."[45]

"Separation of the Universal," then, becomes the main bone of contention throughout Aristotle's criticism of Platonism in Books XIII (Mu) and XIV (Nu). The problem is precisely this: how is Aristotle going to save knowledge without losing the real world? While he certainly seems willing to exorcise separate Universals from his own philosophy, he is not so willing to release Universals from the value of knowledge, "for without the universal we cannot acquire knowledge."[46]

The philosophy of his predecessors weighs heavily on Aristotle's own philosophy. Highest knowledge was all-encompassing knowledge--

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[44] Meta. III, 1003 a 15; XIII, 1086 b 5 and 33; De Anima 417 b 23; Posterior Analytics 87 b 38.


universal knowledge, knowledge that could be applied to the whole—the total structure. The Ionian pioneers in philosophical speculation may not have expressed this epistemological difficulty, but the problem is implied in their attempt to formulate a universal world view. The Pythagoreans saw fit to explain over-all harmony in the universal truths of mathematical and numerical values. Parmenides sharply distinguished the "Way of Truth" from the "Way of Opinion," in which the former "Way" reveals the intellectual universality of being in its permanent and complete structure. Thus universality is more clearly aligned with "highest knowledge." Even the Heraclitean notion of Panta Chorēi contains a left-handed expression of the all-encompassing view. Here, too, Heraclitus grounds his universal change theory intellectually rather than perceptually with his "Word" or "Logos."

Not only is highest knowledge linked up ontologically with universality, but also epistemologically two distinct modes of knowing are defined—intellectual cognition and sensory perception. Plato, of course, completes this two-fold task by distinguishing epistēmē from doxa in which distinction the former attains to universals whereas the latter deals with changing particulars.

Aristotle inherited these views of cognition; and while he explicitly and unequivocally rejects any separation of universality from individuals, he does not explain his own view of universal knowledge in a clear and consistent manner. It may be that an analysis of the nature of principles as ground of knowledge could render some plausible interpretations.
We have already cited five specific passages in which Aristotle clearly states that "knowledge is of the universal" (cf. Fn. 44 above). But since the universal is not allowed to be separated from the particular, Aristotle is compelled to say how it is that we know particulars in a "universal" way. Furthermore, if the sharp distinction between the "senses and intellect" is to be retained, then the question arises: how can we know particulars at all since these latter are objects of senses and not of intellect? Does the mind (nous), after all, grasp universal principles that are just as separate as Plato's Ideas? Aristotle himself gives every indication of being very much aware of these problems, especially after he has criticized Platonic theory, and begins to outline his own: "The doctrine that all knowledge is of the universal, and hence that the principles of existing things must also be universal and not separate substances, presents the greatest difficulty of all that we have discussed." It is interesting to note that in the admission of the problem Aristotle reaffirms the referential character of "principles" as the intelligible aspect of beings. The answer that he offers to the question concerning cognition of things must involve "principles." He says in effect that if knowledge is universal, then principles must be universal in some way. How are principles universal? This is the "greatest difficulty of all." That the "universal principles" must not be separate from things is no great problem now, since the Platonic

47Meta. XIII, 1087 a 11-14.
separation has been rejected. Proceeding in an attempt to answer the
difficulty, Aristotle first dares to qualify his earlier assumption that
"all knowledge is of the universal."

"There is, however, a sense in which this statement is true,
although there is another in which it is not true." 48

The basis for this problematic distinction is found in the act-
potency principles of perishable particulars and the knowledge of those
particulars acquired through principles. Because of the act-potency
aspects of individuals, knowledge has two senses: a particular-definite
sense and a universal-indefinite sense. Actual knowledge is knowledge
of a definite individual thing; knowledge of a universal character is
potential knowledge, i.e., a knowledge of what might possibly be the
case in an indefinite number of things. This latter sense of knowledge
is based on the formless, "material" side of particular entities which
opens them up to any number of possibilities. 49

For Aristotle, therefore, universality is not separate from par-
ticals. Universality is "in" particulars, not as entity but as principle--

48 Meta. XIII, 1087 a 15.

49 Perhaps the notion of "potentiality" in Aristotle's philosophy
has not been given sufficient attention by contemporary thinkers. Possibly
the dynamism that might be found in Aristotle and its possibilities of a
world view of change have been overlooked because of medieval inter-
pretations in which "Pure Act" reigns supreme and "potency" is a static
concept used merely to designate the "lower" limit of reality (Pure Potency)
as distinct from the "highest" limit of reality (Pure Act). It is ironic,
perhaps, that in a closed system even the concept of God as Pure Act has
become static. That Act should become static is due to no mean intel-
lectual achievement! At any rate, it seems that Aristotle's potential
principle might serve as a basis for more dynamic views of a world
opened up to an infinite number of possibilities.
principle of potentiality. And it is this potential aspect of particulars that explains the universal sense of knowledge.

Knowledge, like the verb "to know," has two senses, of which one is potential and the other actual. The potentiality being—as matter—universal and indefinite, has a universal and indefinite object; but the actuality is definite and has a definite object, because it is particular and deals with the particular . . . it is clear that although in one sense knowledge is universal, in another it is not. 50

Now just exactly what Aristotle means here may not be perfectly clear, but at least this much seems certain: there is no actual (singular act of) knowledge of universals because universals as such do not actually exist. Any individual act of cognition has as its referent object an individual, particular entity. The universal aspect of knowledge somehow enters into the area of mental expressions through the individual object's potentiality principle. Perhaps the universality enters into the cognitional act insofar as other similar cognitional acts are possible when a knower confronts other individuals whose potentialities are similarly actualized. Aristotle himself does claim that "the potential and the actual are in a sense one," 51 insofar as principles are not entities themselves but are aspects of entities. It seems consistent, then, to locate the root of all generalizations about entities in a principle of possibility since only individual Beings actually exist. This view of the universality of knowledge presented here by Aristotle runs counter to

50Meta. XIII, 1087 a 16-25.

51Meta. VIII, 1045 b 21.
the Platonic universality of the Forms. Also, it does not seem consistent with the scholastic theory of abstraction of forms from matter. In fact, this notion of Aristotle seems more in harmony with the aim of modern science to form loosely structured general theories rather than assign an absolute value to mental constructs. By analyzing individual cases, one can form general notions of what may possibly be the case concerning other individuals or what may be other possibilities for this individual. In either case, universality always remains in the realm of possibility and never in the realm of actuality.52

Before allowing ourselves to make such an interpretation, however, we must first see if this passage of Aristotle in which universal knowledge is grounded in the potency principle is consistent with Aristotle himself, i.e., with the general context of the Aristotelian corpus. In that one passage above which clearly links potentiality with universality, Aristotle is attempting to explain away separate universals and still retain universality as part of knowledge. There are, in addition, at least two passages set in a totally different context which still seem to imply a similar notion of potentiality.53


First, in the De Anima Aristotle applies his notions of being as potential and as actual as aids for understanding human instruction or learning (epistemon). There are three ways, he states, in which a man is said to be "learned": 1) insofar as he belongs to a class of learned people who have knowledge; 2) insofar as he is well instructed in a specific area (e.g., grammar); 3) insofar as he manifests his learning in the act of knowing something. Aristotle claims that the first two meanings of "learned" involve a potential mode of being; the first is the general class of learned men (Aristotle likens this classification to the matter rather than to the form—i.e., indefinite and universal rather than definite and particular). The second meaning involves a potentiality inasmuch as the man is capable of divulging some knowledge provided there are no external impediments. The third meaning involves actuality. The man is actually manifesting his learning by knowing "this particular A." In these examples Aristotle again seems to be grounding universal knowledge in the principle of potentiality while connecting particular knowledge with what actually is the case.

In the Metaphysics, while discussing specifically the actuality-potentiality principles, Aristotle indicates how these principles are "in a sense the same." Both indicate the "presence of the thing" though not exactly in the same way. Potentiality indicates a thing's presence by what can be conceived apart from the thing. One can paradoxically say that potentiality indicates something's presence

54De Anima, 417 a 22-30.

55Meta. IX, 1048 a 31-40; 1048 b 1-6.
by what is absent. For example, the presence of wood is known in a more meaningful way by the statue which can be carved from it, but is not yet actually carved; or the whole line is viewed in terms of half of the line which does not actually exist, but which can be extracted from the whole. Aristotle's third example is that of a man who is called "scholar" even though he is not actually studying. The term "scholar" properly applies since he is capable of studying. In terms of potentiality, the scholar is present through an absence. This again indicates the unity of act and potency which was mentioned earlier; and, more important for our present purpose, it manifests the universal character attached to the potentiality principle. In proceeding to explain "actuality" as the presence of a thing on the "opposite side" of that same thing's potential presence, Aristotle 1) refuses to give a general definition of actuality and instead examines particular cases inductively; and 2) refuses to consider those particular cases apart from their general background of potentiality. The first refusal clearly aligns the actual with the particular; the second highlights the importance of a universal (and potential) background for a better understanding of what actually is the case. 56 Aristotle writes:

56In developing his hermeneutic phenomenology, Heidegger objects to the Husserlian brand of phenomenology which aims at describing. The phenomenological approach for Heidegger must be interpretative (Hermeneuein), i.e., not only describing but anticipating all modes of possibilities. Husserl envisions a science of actually described facts. Heidegger states that "higher than actuality stands possibility." cf. Martin Heidegger, Being and Time, trans. J. Macquarrie and E. Robinson (New York: Harper and Row, 1962), p. 63. Needless to say, according to our interpretation, Heidegger is very Aristotelian on this point.
That which is present in the opposite sense to this (to potential presence) is present actually. What we mean can be plainly seen in the particular cases inductively; we need not seek a definition for every term, but must comprehend the analogy: as that which is actually building is to that which is capable of building, so is that which is awake to that which is asleep; and that which is seeing to that which has eyes shut, but is capable of sight; and that which is differentiated out of matter to the matter, and the finished article to the raw material. Let actuality be defined by one member of this analogy and the potential by the other.\(^5\)

Having added two more texts to support the original text that identified "universality" with "potentiality," we can now, perhaps, consider those texts which explicitly claim that "knowledge is of the universal." It would seem that this cannot mean that actual knowledge is of the universal and still be consistent with the three passages cited above. In those three instances, actual knowledge can be of the particulars and of nothing else. Aristotle does, however, seem to speak of actual knowledge of the universal which would run counter to the texts thus far examined. This apparent inconsistency seems to arise whenever he distinguishes sense perception (aisthesis) from knowledge (epistēmē).\(^5\)

When this distinction is made, Aristotle implies that there might be two kinds of actual knowledge: the sensory cognition of particulars and

\(^5\)Meta. IX, 1048 a 35; b 1-16.

\(^5\)It was noted above that in addition to inheriting this problem of how knowledge can be universal in the face of apparent individuals, Aristotle also inherited a "senses vs. mind" distinction. Plato, while radically distinguishing doxa from epistēmē, can more easily avoid inconsistency by radically distinguishing (separating) individuals from Ideas. In light of the historical setting it would be surprising not to find any inconsistencies in a "realistic" attempt that assumes an intelligible world.
the intellectual knowledge of universals. This, of course, presents the problem as to whether or not we actually know individuals or universals or both. If "actual knowledge" more properly applies to individuals, then this talk of "knowledge of universals" is meaningless. If, on the other hand, "actual knowledge" more properly refers to universals, then Aristotle's critique of Platonism is meaningless. If both individuals and universals somehow are to find a place in the cognitional scheme of things, then Aristotle still must show how he is to avoid a separate realm of universals.59

The questions that must be asked in order to throw some light on this Aristotelian dilemma are these: what is the precise meaning of Aristotle's use of the expression "knowledge is of the universal"; and, secondly, to what extent does Aristotle exclude sensations from the realm of knowledge?

In the Metaphysics he writes: "If nothing exists apart from individual things, nothing will be intelligible; everything will be sensible, and there will be no knowledge of anything--unless it be maintained that sense perception is knowledge."60

Again in the De Anima, Aristotle would seem to exclude sensations from any claim to knowledge: "Actual sensation is of particulars, whereas knowledge is of universals."61

59Boas claims that Aristotle is hopelessly involved in a contradiction of trying to hold to a "knowledge of universals" and, at the same time, distinguish true judgments from false judgments concerning individuals. cf. Boas, op. cit., pp. 45-46.

60Meta. III, 999 b 1-3.

61De Anima, 417 b 22.
And in the *Posterior Analytics*: "Since demonstrations are universal, and universals cannot be perceived by the senses, obviously knowledge cannot be acquired by sense perception."62

These passages in which Aristotle seems to claim that no knowledge is possible through sensory awareness appear to be inconsistent with his previous attempt to establish a ground for actual knowledge in the concrete individual.

In the first passage (from the *Metaphysics*), Aristotle offers a notion of separated substance as an hypothesis. He suggests that sensible objects partake of intelligibility only insofar as there are separate intelligible entities. It is, perhaps, the most Platonic passage in Aristotle's works; but it is significant that he formulates it hypothetically. In writing this passage, he is preparing to shift from a study of "perishable" entities to a study of "imperishable" entities. The transition seems difficult for him in light of the "heaven and earth" distinction passed on by his predecessors. Later he tries to overcome some of the differences between these "two realms" by applying the same principles to both realms which can, therefore, come under the common rubric "nature." This attempt of Aristotle shall be considered in a subsequent chapter.

The second passage (*De Anima*) does not seem to present the difficulty that first appears. Aristotle is discussing the general character of sensation in which he tries to explain how sentient beings move from having possible sensations to having actual sensations. He insists that

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62 Post.An. 87 b 32.
the efficacious cause of actualizing sensory powers must be found in individuals external to the thing having the sensation. Strictly speaking, one does not "think" individuals, rather one must see, hear, taste, touch or smell them; but this does not mean that sensations cannot be included in a broader meaning of "cognition." Looking at the more complete text, we read:

Actual sensation corresponds to the exercise of knowledge; with this difference, that the objects of sight and hearing (and likewise of other senses) which produce the actuality of sensation are external. This is because actual sensation is of particulars, whereas knowledge is of universals. These in a sense exist in the soul itself. So it lies in man's power to use his mind whenever he chooses, but it is not in his power to experience sensation; for the presence of the sensible object is necessary.63 (Emphasis mine.)

In short, there is not sufficient warrant here for accusing Aristotle of failing to "know" individuals. Sensations are really (actually) prompted by real individuals. Furthermore, there may be a way to detach these objects of sensation from their real status and think about them in a general (universal) way. We can do this general thinking any time we please, but we can have direct sensory experiences only when confronted with actual, individual, external things.64 Nor is all of this inconsistent with a realm of actual individuals whose actuality is set in a background of possibilities (mental or otherwise). One may point out that Aristotle never sufficiently explains the disparity between actual confrontation of particular things and

63De Anima, 417 b 18-28.

64Perhaps here there is even the hint of Hume's distinction between the forceful and immediate data of experience (Impressions) and the less vivid thoughts about these experiences (Ideas).
man's ability to generalize. The point would be well taken—he does not. One might also choose to take issue with Aristotle's descriptive "psychology," but anyone who claims some share in a philosophical realism must acknowledge some pioneering in the face of great odds.

Neither does the third passage (Posterior Analytics) present that great an inconsistency between "knowledge of universals" versus "actual knowledge of individuals." In the context of this quotation, Aristotle is referring to a specific type of knowledge, viz., demonstration (apodeixis). He maintains that sense perception cannot obtain the reasoned fact. His example is that of a triangle having angles equal to two right angles. Even if one could perceive that this was the case, still the proof or demonstration of this fact would go beyond the scope of sensory perception. Furthermore, he tells us, what is demonstrated holds for all cases, i.e., it is universal. Sense perception, on the other hand, puts us in contact only with particulars. One can see a particular triangle, but one cannot see that its angles are equal to two right angles. This must be known through demonstration; and since these demonstrated facts are universal, then "knowledge is of the universal." This enigmatic expression in this context simply refers to the universal axioms arrived at by demonstrative knowledge and does not necessarily rule out any knowledge of particulars. Aristotle wants to maintain the distinction between senses and intellect and still retain a world of changing particulars. The constant use of that expression "knowledge is of the universal" tends to promote a Rationalism and/or Idealism and, thus, obscures Aristotle's original commitment to a changing world. But in
analyzing the more complete texts, as we tried to do, we find that knowledge is also of the changing particular.

It may also be clear now that there are two kinds of "universals" implied in the Aristotelian texts that may "save" him from what at first seems a hopeless inconsistency. First of all, there is the universality rooted in the potentiality of individual things. Such individual things are actually known; but, as Aristotle says, knowledge has two senses, potential and actual. The actual sense of knowledge determines the individual as an individual, i.e., as a particular this. But in the realm of perishables, individuals exist in a background of possibilities. Each particular this carries with it a universal potentiality. For example, a block of wood can be carved into many possible figures. While it is true that what is actually known is this individual, it is also true that this individual's potential aspect contributes greatly to our actual knowledge of this. In fact, as it was mentioned above, Aristotle would not consider actuality apart from potentiality. Let us call this first type of "universality," which is found in the potential ground of individuals, an ontic universality since its value lies in anchoring human knowledge to a real world of changing particulars. In this sense, the expression "knowledge is of the universal" refers to the potentiality of individuals.

The second type of universality we will call "logical" universality. This refers to the universal propositions and conclusions of demonstration. There is no doubt that for Aristotle one has actual knowledge of these universals; e.g., that "the angles of a triangle equal two right angles" is
a universal actually known through a demonstrative process. Sensory perceptions are of no use with these logical universals since individual cases do not enter into the demonstration. In this sense, "knowledge is of the universal" refers to the actual propositions of demonstration.

It may be now asked what is the relationship, if any, between the potential universality of individuals and the actual universality of propositions? Unfortunately, Aristotle himself never tells us how individuals can become universalized in logical propositions. Nor does he say how universal propositions can be used to demonstrate truths about individual facts. He seems to assume that his type of deductive demonstration can be applied to the realm of individuals, and this assumption shall be dealt with subsequently.

At any rate, Aristotle's "principles" save him from the necessity of having to forsake either the universality connected with knowledge or the senses-mind distinction. In the bargain, Aristotle is consistent with his basic assumption of keeping "in touch" with a real, intelligible world of particulars. Whether or not any particular fact can be demonstrated (proven logically) in his system remains to be seen.

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65 Perhaps the closest he comes to such an explanation is his metaphor of stopping a rout in battle (Post. Ana. 100 a and b) This shall be dealt with again. Also, the traditional scholastic view claims to follow Aristotle in abstracting the form from individuating matter and, thus, universalizing the form in the mental concept or idea. It can be debated, however, whether Aristotle's "forms" admit of such universalizing since he seems to ground an individual's universality in the material (potency) principle.

66 One of the chief criticisms leveled against Aristotle's logic by modern logicians is the former's failure to allow for all possible individual cases. cf. Ernst Cassirer, Substance and Function (Chicago: Dover Publishing Co., 1953), p. 4.
Principles as Irreducible Contraries

In the last section it was indicated that a legacy of knowledge as universal was willed to Aristotle who then tried to reconcile that legacy with a realm of perishable particulars. Within that same realm, Aristotle's inheritance also included a notion of contraries (enantia) which played an important explanatory role in pre-Socratic cosmology and Platonic Transcendentalism. The Wet and Dry, Hot and Cold, Love and Strife; the Limited and Unlimited, the Great and Small, Odd and Even— all of these, and more, represented attempts to "fix" a cosmos between terminals of opposition. Aristotle accepts this view that things in motion involve a basic antithetical polarity (at least in the realm of perishables, though in the eternal heavens "principles" cannot be contraries, as we shall see), but he subtly modifies this notion by adding his own intellectual refinement embodied in the meaning of his "principles." The view that we are given of his multifarious principles in this context is one of irreducible contrariety.

The type of Aristotelian irreducibility attached to the principles is two-fold: there is an irreducibility of number and of kind.67 Concerning the former type, Aristotle will not allow that principles be reduced to an infinite, never-ending sequence.68 Reducing principles to such a state destroys the basic assumption of an intelligible world. Of course, Aristotle's


68 Meta. III, 996 a 1-2 poses this question.
world of perishables is intelligible through the four-fold causal view; and it is along these lines that he rejects an infinite number of principles. Without pretending to offer any kind of "proof," he simply states that an infinite series is unthinkable concerning 1) material generation, 2) the source of motion, 3) the termination of motion and 4) the "what it is" that moves. Finally, he connects the discussion with knowledge claiming that: "On this view (an infinite series of principles) it is impossible to know anything until one comes to terms which cannot be analysed (atoma)." 69

In this context, Aristotle is speaking mainly of definition and demonstration to support his claim. He says in effect that if everything is definable, then nothing is definable. Taking "definition" in its literal sense of "de-limiting," one's "definition" of something would constantly wait upon a further definition, and so on ad infinitum, thus destroying the very meaning of what we assume to know here and now. And the same holds for demonstration. If everything can be demonstrated, nothing could be demonstrated since there would be an infinite dependence upon more prior proofs. 70 The only type of infinity Aristotle allows for is potential infinity, as in the possibility of conceiving a line in respect to its unending divisibility. Even "the concept of infinity is not (actually) infinite." 71


70 Principles in their connection with demonstration will be considered more thoroughly in a later chapter.

71 Meta. II, 994 b 29.
In addition, principles cannot be infinite in kind for Aristotle; i.e., not only are they irreducible to a numerical sequence, they are also irreducible to each other here and now. This latter concept of principles added a new dimension to the notion of contraries found in pre-Socratic and Platonic thought. Aristotle questions the nature of pre-Socratic contraries.\textsuperscript{72} If they are to be the true antithetical poles of change (and Aristotle assumes that they are), then in the first place, such principles cannot be derived from each other. Basically, Aristotle is arguing against the generation of one contrary "out of" another. "The Hot" cannot come from "The Cold"; "The Wet" cannot come from "The Dry." He does not accept the assumed axiom that "opposites generate opposites,"\textsuperscript{73} since it destroys the true antithetical character of principles. He would not accept, therefore, Plato's "proof" for the immortality of the soul in which "life" is generated from "death."\textsuperscript{74} Secondly, such principles cannot be derived from anything else if they are to be primary. They must be underived, presupposing nothing prior; otherwise they will be intermediate principles and not the true antithesis enclosing and explaining a given object.

Aristotle recognizes the groundwork done by his predecessors in conceiving antithetical couples but adds his own refinements.

\textsuperscript{72}\textit{Physics} I, 5 in toto.


\textsuperscript{74}\textit{Phaedo}, 70 a-e.
Clearly, then, all assume certain numbers of antithetical couples as principles; and not without reason for "principles," being themselves primary, must not be derived either from each other or from anything else, and all other things must arise out of them. The terms of a primary antithesis fulfill the condition; for, because they are primary, they cannot be derived from anything else, and because they are antithetical, they cannot rise out of each other.⁷⁵

Aristotle considers his principles to be truly primary because they are truly irreducible; and being irreducible (contraries) they are truly principles, i.e., not entities themselves which would admit of further divisions. He never considered his predecessors' principles to be adequate as principles--they were not truly primary nor contrary; therefore, not truly principles. "Their assumptions and first principles are wrong, and it is difficult to propound a correct theory from faulty principles."⁷⁶

Aristotle's principles as true contraries could do something that pre-Socratic and Platonic contrariety could not do, viz., both principles could be present together as unifying and yet contrary principles of changing things. For example, the contraries Form and Privation are present together in things, likewise Act and Potency. This is quite impossible for the pre-Socratics whose "first principles" were a material stuff allowing for no contrary stuff which could serve as a substrate; therefore, opposites must be generated from opposites making the contraries existentially incompatible. Plato's contraries did not simultaneously coexist since a separate and independent status was assigned to each. The problem of participation arises

⁷⁵Physics I, 188 a 27-31.
⁷⁶Meta. XIII, 1086 a 15.
in Plato's philosophy when changing objects must first "participate" in one
Form and then participate "in the contrary Forms," but never together; only
Aristotelian "principles" and not "things themselves" could function as co-
existent terminals which could allow changing beings to have within
themselves a certain intelligibility.

As Aristotle sees it, the contraries as such do not change; rather
"change is from something into something." 77

The contrary principles need a third principle acting as a substrate
upon which the antithetical principles operate. 78 This third principle
operating between the contrary principles is, of course, the material sub-
strate of Form and Privation. 79 Aristotle also makes this appeal in the
more dynamic language of his act-potency principles. The ultimate set of
contrary principles is Being and non-Being, and a proper understanding of
the changing, perishable entities recognizes an intermediate principle of
becoming. "'Becoming' is always intermediate between being and non-
being." 80 According to Aristotle, the failure to recognize this middle
ground principle between contraries proves to be the fatal flaw of his
predecessors. Plato especially, who took Being and non-Being as basic
contraries, wrongly associated "non-Being" with "falsity." 81 Plato was

77 Meta. IV, 1012 b 29.
78 Physics I, 189 b 1-4. Aristotle identifies this third principle as
the material cause in the philosophy of the pre-Socratics.
79 Meta. XII, 1069 b 30-34.
80 Meta. II, 994 a 28.
then left with a notion of "being" as Substance alone or as mere forms and, understandably, had difficulty deriving a "many." Furthermore, Aristotle continues, Plato could never explain a multiplicity of "affections" (pathê) and relations (pros ti) since he "formulized" these categories (accidents) as separately existing. "For it may be said that since they (accidental contraries) are not separable, it is because the substrate becomes or is many things that qualities and quantities are many."82

Aristotle's notion of principles as irreducible contraries simultaneously present "in" things and mediated by a substrate principle offered an explanation of changing particulars which need not look beyond those particular entities. In Aristotle's theory of principles, then, he can adopt the notion of contraries quite readily by "adding" the notion of irreducibility. "Contraries are not compounded with one another and are therefore first principles."83 Intermediates "straddle" the contraries and "must be composed of contraries,"84 i.e., the intermediate stages of a changing object belong to the same genus as the contraries. For example, red as an intermediate between the contraries black and white belongs to the same genus of color and, thus, is composed of the contraries.85 Aristotle seems aware, however, that this example of an "accidental

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82 Meta. XIV, 1089 b 24-26.
83 Meta. X, 1057 b 23.
84 Meta. X, 1057 b 32.
attribute" must be subsumed under "higher" (more general) contraries, viz., Form and Privation, Act and Potency. Without this distinction, Aristotle would be guilty of a gross inconsistency in his criticism of Platonic contraries. He writes in the *Metaphysics* XIV (Nu) that "none of the contraries is strictly a first principle; first principle is something different."86 This indeed seems hard to reconcile with some of the above passages. Are "principles" contraries or not?

Aristotle would have it both ways; his notion of contraries, as basic irreducible aspects of things, is one of "principle." "Everything is reducible to being and non-being."87 But he will not allow Plato to give entitative status to contraries. In this latter Platonic sense, contraries are not principles; because as contraries they are attributes of things, and whatever is an attribute cannot be a first principle since it is predicated of something more prior. In short, Plato tried to raise attributes (called contraries) to the level of *ousiai* which for Aristotle are the primary instances of being and have no contrary.88 Insofar as the contrary attributes of Plato are not separate substances, then the contraries are not principles.89

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86 *Meta.* XIV, 1087 b 4-5.

87 *Meta.* IV, 1004 b 28.

88 Anton calls Aristotle's examples of contraries that are attributes--such as white, black, hot, cold--instances of specific contraries which involve "accidental changes." These specific contraries merely suggest the "metaphysical contraries which are pervasive, general, all inclusive and deal with substantial change. These metaphysical contraries are true instances of first principles." John P. Anton, *Aristotle's Theory of Contrariety* (London: Routledge and Kegan Paul, 1959), p. 12.
In other words, by hypostatizing the contraries, Plato removed them from their role as explanatory of perishable entities having a dynamic inner tension of contrariety. In reifying contraries, Plato makes them irreducible entities each unique, absolute and immutable in its own eidetic way. Any understanding of the "realm of perishables" becomes difficult indeed in these terms. If no contrary (Form) can be wholly present in that which is in motion or process, then how can we say that we know that which is in process? The whole problem of participation is raised in which the hypostatized paradigms have to "step in" and "slip out" of changing entities in a staccato like sequence, but never can contraries exist simultaneously "in" perishables. Aristotle thinks that these are the difficulties that are engendered when the contraries are made into substances. For Aristotle, substance is the "primary instance of being." 90 That is to say, substance is the prime ontic ground; as such, "there is no contrary to substance." 91 In fact, "it is of substance that the philosopher must grasp the first principles." 92 Thus for Aristotle, the contraries are the irreducible reasons why there are perishable ousiai. There are no static ousiai in this realm. What a thing actually is is understood in terms of one contrary (actuality) which is sometimes expressed as a to ti en einai; but this manifestation of something is always set in the background of

90Meta. IV, 1003 b 17; also 1028 a 31.
91Meta. XIV, 1087 b 3.
92Meta. IV, 1003 b 18.
another contrary principle—Potentiality. Ousia is present through an absence. Things are and are not simultaneously—without violating the principle of contradiction—Being and not-Being (becoming) find harmony within the realm of things that are (changing).

Aristotle can say, therefore, that the contraries are principles when it is realized that as principles the contraries are of a substance and not a substance itself. The referential character of principles is carried through. Plato's contraries are not principles since they are hypostatized into entities themselves.\(^9\)

Aristotle, perhaps, "solves" one problem by giving some kind of understanding to things-in-process; but he seems to create another problem which he wills to philosophical posterity. The problem is this: Is oušia a principle? From what was stated above, it certainly cannot be a contrary. Perhaps we can say with Aristotle that contraries (Act-Potency, Form-Privations) are principles, but is the converse true? Are all principles contraries? Substance has no contrary. Aristotle makes this point clearly enough in rejecting Plato's contrary substances. Hence, in endowing oušia with some sort of ontological primacy (perhaps "entity" best translates oušia in this sense), the notion of "principle" would not seem to apply in a proper sense. "Neither 'being an element' nor 'principle' can be the substance; but we ask what the principle is so that we may refer to something

\(^{93}\) Not only does the referential character of principles help understand Aristotle's criticism of Plato but also the universality in a potential sense helps as well. Plato's universals were actual entities while Aristotle "locates" universality as an (potential) attribute of individuals.
more intelligible." On the other hand, if Aristotle wants to establish ousia as the primary instance of being, might we not call ousia some kind of ontological principle? In this sense, substance seems to be some kind of ground for Being qua Being which is supposed to be the point of issue in the Metaphysics. Anton suggests that "substance is the ontological principle and contrariety is a necessary principle for its intelligibility." 

This interpretation, however, completely ignores the relation of Aristotle's realm of perishables with that of the imperishables. It is true that in dealing with contraries one need not be concerned with beings that do not change and, hence, need no understanding through contrariety. But Aristotle himself seems to relate the two orders through the notion of "substance" and "principle":

Perhaps in this way (making a fresh approach to the problem "what is substance") we shall also obtain some light upon that kind of substance which exists in separation from sensible substances. Since, then, substance is a kind of principle and cause, we had better pursue our inquiry from this point.

Which, then, is the proper "ontological principle," sensible substance or separate substance? Once the realms are related, Aristotle's theory of principles becomes entangled in further complications. It would seem that "sensible substance" cannot be a principle since substance is "the thing"--the changing thing--which "principles" (as contraries) explain. In what sense, then, would Anton call the perishable ousiai "ontological"

95Anton, op. cit., p. 72.
96Meta. VII, 1041 a 7-10.
principles? On the other hand, if Aristotle says that imperishable substance is a "kind of principle," does he mean that these kind of principles are things rather than explanations of things? Or, perhaps, does he mean both? Could it be that separate ousiai are things which explain sensible things? And if this is the case, might not the ultimate meaning of Aristotle's arche be just as separate and immutable an entity as any of Plato's Ideas?

There might be another alternative. Perhaps Aristotle never commits himself to a clear-cut meaning of arche that seems to be implied in the above problems. He constantly tempers his language with expressions such as "a kind of principle"; "in one sense it is, in another sense it is not." In more formal language, principles seem to have an analogous character which shall soon be considered.

On the one hand, principles as analogous tend to erase any rigid lines drawn between the two realms; and, yet, because they are analogous, certain lines have to be drawn. Aristotle would have qualitative differences existing between types of entities both in the formal differences of classes of things on earth and in the eternal entities of the celestial spheres. The formally structured world is--while qualitatively different (not until Galileo will "forms" be quantitatively conceived)--strung together in an analogous hierarchy. Perhaps Being qua Being is the analogous bond, perhaps actuality is the existential link. At least it seems certain that principles as analogously conceived relate what--there--is to man's understanding. And since they are analogously conceived, Aristotle needs no literary myth form.
Analogy can ground all qualitative differences in a common denominator—archai. Whether or not his principles can be viewed as hypotheses for the beginning of scientific knowledge as Anton suggests remains to be seen. Viewing Aristotle’s theory of principles in terms of the philosophy that preceded him, it is seen that his principles as irreducible contraries represent an understanding of changing entities. If such types of entities are to be understood, the terminals of change must be grounded "in" things. Yet the contraries cannot be identified with the things since, then, there could be no basis for understanding changing entities; and the realm of perishables would lose its intelligible character in the face of a Heraclitean like flux. The ground is realized in the notion of contraries as principles of things whose referential character preserves the ontic contact with "the real" and whose irreducible character prevents the contraries from being "compounded" with the entity that is changing. For Aristotle, then, opposites do not generate opposites; in fact, the irreducible, contrary principles contribute nothing to the process of change; their contribution lies in rendering change in some way intelligible. In surveying previous philosophies, Aristotle saw no such intelligibility, neither in the material archai inherent in things nor in the separated Forms of Plato. Being irreducible, the archai of Aristotle are not material inherents; being referential, they are not separate entities.

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97Anton, op. cit., p. 9.

98They are not "causes" in a stricter sense of Aristotle's efficient cause which becomes involved in the process of change. The contraries do contribute, of course, to one's understanding of change.
Thus far we have considered the irreducible aspect of Aristotle's principles by comparing his notion of contrariety with the philosophers that preceded him. Now, however, we might ask how well Aristotle's principles as irreducible contraries stand the philosophical test today. Can, for example, the basic contrariety of Act-Potency be applied as a dynamic process philosophy today? Is there a hint of novelty, invention, discovery and evolution in these principles? Or are these principles simply names for predetermined events that can never really alter their patterns, whereby only what is an acorn can become an oak, or only what is heavy can move from "up" to "down"?

Needless to say, commentators throughout the ages have opted for one or the other interpretation and have found--no doubt--ample texts to support their claims. Running the risk of constantly seeking middle ground until there may be no ground at all, we might still try to aim for some place in the middle. In the first place, I have already indicated that Aristotle's principle of potentiality provides sufficient warrant for a dynamic process interpretation. To convert Aristotle completely into a process philosopher, however, one would have to ignore certain passages which relate "process" to immutable principles. Anton asserts that not only do Aristotle's contrary principles "provide a criterion for the intelligibility of process," but by relating his other basic concepts to the notion of contrariety, "it is possible to state with new forcefulness and freshness the equal significance of all principles of knowledge as 'beginnings' of scientific inquiry and to treat satisfactorily this rather neglected principle."99

99Anton, op. cit., p. 9.
The question remains, however, whether Aristotle intends "principles" to be "beginnings" in the way that Anton suggests. Anton supposes them to be some sort of scientific hypotheses in the modern sense in which the beginning of a scientific investigation involves the postulation of a theory (hypothesis) and proceeds to factual verification or falsification. In this scientific approach today, theoretical knowledge is set in contrast to factual knowledge so that if the facts do not support the theory, the latter is abandoned as impractical or false, or both. Whereas if the facts support the theory, then the theory is no longer a mere hypothesis; and in this sense, the knowledge is removed from the theoretical realm. Aristotle, on the other hand, contrasts theoretical knowledge with practical knowledge in such a way that the two are not opposed at all.

Theoria contains the general principles assumed in the doing or making of something. The man of theoria has a grasp of ultimate principles that tell why a thing is what it is or can do what it does. "Accordingly, although all other sciences are more necessary than this (science of first principles) none is more excellent." It is highly unlikely that Aristotle viewed "principles" as the flexible, changeable type of "beginnings" formulated in the hypothetical theories of science today. For Aristotle, "first principles" are not the beginnings of knowledge, but rather the termination and culmination of highest knowledge. Also, the question of "science" and "scientific inquiry" is begged in Anton's claim that Aristotle's "principles" may serve as "beginnings of scientific inquiry."

100 Meta. I, 983 a 10.
On the other hand, I do not know if I would be as severe a critic as John Dewey who writes:

Potentiality never means, as in modern life, the possibility of novelty, of invention, of radical deviation, but only that principle in virtue of which the acorn becomes the oak. Technically, it is the capacity for movement between opposites. . . . Potentiality instead of implying the emergence of anything novel means merely the facility with which a particular thing repeats the recurrent processes of its kind, and thus becomes a specific case of the eternal forms in and through which all things are constituted. 101

Now it is true that Dewey's pragmatism, in which practical consequences are given prior consideration, can render Aristotle's principles rather meaningless. On the other hand, this may not be the only interpretation. First of all, Aristotle from time to time gives hints of a purely potential view of the material substrate. 102 Could it not be possible to translate this view of "primary matter," as it was sometimes called, into modern, dynamic expressions such as "Any physical thing can be changed into any other physical thing under the proper agency (efficient cause)."

If the expression "pure potency" means anything, does it not leave things of the physical world open to any number of possibilities? Furthermore, Mortimer Adler interprets the Aristotelian matter-form principles in terms of the manufacturing endeavors of the human species. Only man, Adler states, can manufacture since it involves the conceptual separation of "forms" which are then imposed upon many possible units of matter. 103

And, of course, science has not fared badly with the Aristotelian terminology when it claimed that: "Matter is neither created nor destroyed, it is only changed in form."

Concerning the more specific principle of Potentiality which Dewey criticized above, we read in the *Metaphysics IX*:

Now, if as we have said, that what is possible is that which does not involve an impossibility, obviously it cannot be true to say that "x" is possible, but will not be; this view entirely loses sight of the instances of impossibility.\(^{104}\)

Viewed historically, Aristotle is clearly aiming his sights at too rigid a view of being and non-being, especially as held by Parmenides and Plato. Through his notion of potentiality, Aristotle distinguishes absolute non-existence (nothingness) from relative non-being (potency).\(^{105}\) The former distinction deals with impossibilities, the latter with real possibilities. He is the first thinker to give significant insight to "possibilities."

It is true that he formulated a principle of non-contradiction which deals with being and not being; but this principle is not as rigid as it may first appear, since before it can be stated whether something is or is not, it must be ascertained to what extent something can be. A contradiction principle can only be applied when "impossibility" is assured, and this is not so easily determined. It is also true that in the above passage Aristotle is making just as strong a case for impossibility (the measurement of a diagonal) as he is for possibility, and this is a notion (impossibility) that

\(^{104}\)Meta. IX, 1047 b 1-5.

modern science will treat with extreme caution. The modern scientific attitude is reluctant to declare in a definitive way that "something" may be impossible. On the one hand, Aristotle's formulation of his contradiction principle at first seems too severe and rigid involving as it does the notion of "impossibility." On the other hand, today's scientific approach considers it presumptuous to declare "impossibilities." The two views seem to have no common ground, and this is the gist of Dewey's argument against Aristotle: that Aristotle's "possibilities" are actualized only within determined categories and that it is "impossible" for things to cross over into different categories and admit of anything new or novel. However, the two views may not be so far removed from each other as they first appear to be. It has already been mentioned that Aristotle's introduction of the potency concept to the philosophical scene broke down the rigid dichotomy of being and non-being (nothing). The potential aspect of being became a tertium quid between "being" and "nothing"; hence, before his contradiction principle can be applied, all possibilities must be considered. In addition, his notion of "matter" as pure potency tends to erase the rigid lines drawn between the various classes of things and, thus, makes it possible for novel developments.

By the same token, today's scientific avoidance of the term 'impossible' may not be as rigid as it may seem. In refusing to admit "impossibilities," perhaps, science is simply guaranteeing an objective and open-end approach to the investigation of reality. To insure a constant approach of being-led-by-the-facts, and to avoid the close-minded view of an obscurantist, science
in a very general and theoretical way wants to declare that "nothing is impossible." This expression is more of an attitude than a logical utterance. It manifests an attitude of being open-minded and a desire to be led by the facts. When practical consequences are at issue, however, and when specific frames of references are established in order to realize those practical ends, "impossibility" is introduced into the scientific method. For example, within the framework of Euclidean geometry, we can say that "it is impossible for parallel lines to meet." Furthermore, we assume the Euclidean straight-line theory because of its practical consequences; e.g., although the surface of the earth is curved, the relative smallness of the area upon which we build homes, etc. allows us to act as if the area involved straight line measurements. Granting, then, that the modern scientist assumes the possibility-impossibility distinction when practical consequences are at issue and specific categories are needed, Dewey's pragmatism would seem to owe more to Aristotle's potentiality principle and contradiction principle than first appears.

It may be fruitless to criticize the fourth century B.C. Aristotle for not being a twentieth century thinker! From an historical point of view, Aristotle's role had to be limited; but his value is there. Through principles in general we are in touch with a real world. Through a principle of Potentiality that real world has real possibilities that are not yet realized. This does not necessarily mean that Aristotle is advocating some sort of "realm of possible entities" which would become meaningless under the
logical scrutiny of some contemporary thinkers.106 There seems to be no Aristotelian text that would support any such realm of "possible entities." For Aristotle, "possibilities" already have some stake in reality as some sort of universal ground for what already is the case. This notion frees "what there is" from any static type of reality and provides an open end to philosophical speculation. Concerning this enigma of "possibilities," perhaps, we can paradoxically say that Aristotle's "possibles" are everywhere and nowhere. Everywhere insofar as everything in the realm of perishables has its potential aspect; nowhere insofar as potentiality-as-principle strictly speaking does not exist.

The Analogous Character of Principles

The irreducible character of principles as contraries was considered from two points of view: first, insofar as Aristotle developed his archai theory in light of the philosophy of his predecessors; and, secondly, insofar as his principles may or may not be relevant to modern thinking. Within this same frame of reference, another aspect of his principles-as-contraries shall be considered: the sameness's and difference contrariety, which Aristotle expresses in terms of "analogy" or "proportion."

By refusing to allow that principles be corporeal inherents of things, on the one hand, and by denying that principles be separate from things, Aristotle was able to "locate" poles of opposition as explanatory of what changes. Principles as irreducible and referential allowed sameness and

106According to Quine, language about "possible entities" reveals that such entities can neither be identical with each other nor distinct from each other; and in effect, such language is meaningless. Cf. Willard Van Orman Quine, From a Logical Point of View (New York: Harper and Row, 1961), p. 4.
difference to play simultaneous roles in the understanding of a changing thing's nature. An entity's formal and material principles manifest at one and the same time an intelligible constancy with a permanent possibility for new and different forms. An individual's actual and potential principles seem to indicate in a more general way the paradoxical same-but-different notion of individuals that are "on-the-move." The question now is whether those same principles can apply to different cases. How well can these irreducible principles be applied throughout the scope of "what there is"? Are the principles of perishable things the same as or different from the principles of imperishable things? If the principles are the same, then on what grounds are "perishables" distinguished from "imperishables"? Furthermore, when the "realm of perishables" is investigated, there are many different sciences and arts. In the theoretical disciplines, one distinguishes 1) the study of natural entities (physics); 2) mathematics; and 3) the study of "being qua being." In the practical areas, the study of human conduct (ethics) is distinguished from the knowledgeable skills involved in making things (technē). If all of these disciplines are distinguishable, then are their respective "principles" discrete and totally different? Or is there any common ground in principles that can unite the sciences in some way? Aristotle begins his "first philosophy" by discussing the wise man who knows the most basic reasons for all things. One who possesses a knowledge of the first principles possesses the things that are most knowable:

107Meta. III, 1000 a 5-10.
For it is through these and from these that other things come to be known, and it is not these principles that are known through the particulars which fall under them. And that science is supreme, and superior to the subsidiary which knows for what end each action is to be done; i.e., the good in each particular case and in general the highest good in the whole of nature.\textsuperscript{108}

Aristotle evidently envisions an all encompassing science which in some way reveals "principles" and "causes" of all things and of all other disciplines without, however, destroying the autonomy of the particular sciences.\textsuperscript{109} First philosophy is to study being \textit{qua} being by studying the principles of being. But "the term 'being' is used in various senses."\textsuperscript{110}

"Being" is said in many different ways. Aristotle denies, however, that "being" is a "purely equivocal term." It is not purely equivocal (οὐχ ὄνωνόμως) in the way that ζῷον is predicated of a man and of a portrait.\textsuperscript{111} In this latter case, only the name is common. The term "being," on the other hand, always bears a real "reference to (πρὸς ἐν) one central idea and one definite characteristic."\textsuperscript{112} The different modes and meanings of things must be distinguished. It would be a "hopeless task" to proceed philosophically without accepting and examining the

\textsuperscript{108}Meta. I, 982 a 33-35; 982 b 1-8.

\textsuperscript{109}This highly ambitious endeavor of Aristotle has undoubtedly left its mark on anyone claiming the name of "philosopher." Indeed, his notion of the philosophical wisdom-seeker has waned not a little; and the rationalistic interpretation of his first principles as fixed and absolute causes has had little influence outside of rationalism itself; but few claiming the name "philosopher" have not adopted his view of attempting to structure the "parts" into a meaningful whole without destroying the meaning of the parts.

\textsuperscript{110}Meta. IV, 1003 a 33.

\textsuperscript{111}Categories, 1 a 3.

\textsuperscript{112}Meta. IV, 1003 a 34.
"various senses in which things are said to exist." But "being" and "being's principles" are always used in proportion to or analogous with some similar and, hence, unifying meaning.

"For there is analogy between all the categories of being--as 'straight' is in length, so is 'level' in breadth, perhaps 'odd' in number, and 'white' in color." "Being," therefore, enjoys a paradoxical sameness in its differences; and since ousia is the primary instance of being, "it is of ousia that the philosopher must grasp the first principles and causes." If ousia is taken in the sense of "individual entity" somehow placed in the general and abstract background of "being," then the ultimate analogy must rest in the principles of individuals.

When speaking of the "various meanings" of terms, Aristotle distinguishes the purely equivocal use (homonym in a strict sense) from the analogous use of terms having "various meanings." Principles have the analogous character which serves to unite understanding with "the real" in their referential approach to "what there is."

113 Meta. I, 992 b 20. Aristotle consistently examines the "many ways in which things are said" (πολλαχως λεγομενα). In the Topics 129 b 30 and 130 a 4, "Things said in various ways" could destroy the strength of a demonstration if the proper clarifications are not made. In the Nicomachean Ethics 1096 a 24, it is acknowledged that "the word 'good' is used in many senses as the word 'being' is." In the Metaphysics XIII, 1087 a 16, "Knowledge has several senses." And in the Metaphysics V 1013 b 5, "Causes are spoken of with various meanings." In fact, the entire Book V (Delta) of the Metaphysics is proof of Aristotle's concern for the "many meanings" of terms. Our task here is to indicate that the various meanings of principles are not "purely equivocal," but analogous.

114 Meta. XIV, 1093 b 18-21.

115 Meta. IV, 1003 b 18.
Before beginning his discussion of eternal and immutable substances in the *Metaphysics*, Aristotle gives a somewhat lengthy treatment of the analogous character of principles. He states that "in one sense the causes and principles are different for different things; but in another, if one speaks generally and analogically, they are the same for all."\(^{116}\) It seems as though Aristotle is anticipating the great step he must take into the realm of imperishable entities, and he perhaps wants some sort of bridge connecting this latter realm with all that he has worked out concerning the perishable entities. Earlier in the formulating of the *Aporiae*, he had asked whether or not the principles of perishable things are the same or different from the principles of imperishable things.\(^{117}\) If the principles are the same, then how can "perishables" be distinguished from "imperishables" at all? If the explanatory principles are different, then how can one pretend to explain anything about both realms by appealing to a common term--"principles"?

Returning to the realm of perishable beings, Aristotle will not allow that principles bear a univocal sameness with respect to each of the categories. If such were the case, then in effect there would be no categories for all would be the same; e.g., "Relations and substance would have the same constituents."\(^{118}\) The result would be a homogeneous "Being" not unlike the Parmenidean notion.

\(^{116}\) *Meta*. XII, 1070 a 31-32.

\(^{117}\) *Meta*. III, 1000 a 5-8.

\(^{118}\) *Meta*. XII, 1070 a 35.
Furthermore, similarity cannot be explained in terms of the same basic elements (Empedocles) for one cannot take the same elements and combine them into the same being. The basic elements are not the same as the compound entity. But rather than abandon the plurality of basic elements of Empedocles, Aristotle in typical fashion integrates the elements into his own system of archai. "The truth is that, in one sense all things have the same elements and in another they have not." Precisely it is the analogical character of principles that effects the integration in this particular case. The elements are generally the same when viewed in the light of the principles—form, privation and material substrate. That is, all of the perishable bodies "have" these same principles, but the principles are realized differently in different particular bodies. For example, a particular body (substrate) may be hot (form) rather than cold (privation). While it bears its own unique and different characteristics, it bears a general similarity to other things.

Things then, have the same elements and principles, although specifically different things have specifically different elements; we cannot, however, say that all things have the same elements in this sense but only by analogy; i.e., one might say that there are three principles, form, privation and matter.

It is the analogical principles that allow the elements to be elements of all things, while at the same time there are elements of different things.

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119 Aristotle states that neither B nor A can be the same as BA (Meta. XII, 1070 b 7). In more modern terms, we might say that hydrogen and oxygen as separate elements are different from the composed molecule of water.

120 Meta. XII, 1070 b 11.

121 Meta. XII, 1070 b 17-19.
There is a more general view of the analogical character of principles, viz., actuality and potentiality. These last two principles broaden the scope of other principles and thus serve as all encompassing explanations. For example, the more specific principles of Form (as considered separable), the Form-Matter composite and the Privation all can be considered as actualities. The material substratum, on the other hand, is viewed as potentiality since it is in virtue of the substrate that things can become either the form or its contrary privation. Considered in this way, actuality and potentiality are the same principles of sensible things which are nevertheless present in a different manner in different things. In addition to the different ways in which act-potency are "in" things, there is yet another way in which they can be viewed as analogically permeating the perishable world, viz., in light of the cause-effect sequence in which one thing acts upon another. In such cases, one may first view something as "effect" in which the thing has the potentiality for being acted upon; from the point of view of "cause," something is seen as having the power to bring about an actuality in that which does not possess it. This second meaning of "potentiality" gives a kind of double-edged character to dynamis. Things are not only able to be acted upon, but they also have the power to act upon other things and cause various changes. The Latin potentia seems to express the idea of potentiality as a dynamic and

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122 *Meta.* XII, 1071 a 4-5. "There is another sense in which by analogy the principles are the same, viz., actuality and potentiality."

123 *Meta.* XII, 1071 a 7-10.
less passive aspect of things. This interpretation of potentiality freed the principle from sheer passivity whereby perishables are merely acted upon by something higher. On the contrary, there is dynamic action and interaction among the perishables with no necessary hierarchical dependency. There may be analogical continuity between the two realms, but it will be shown that this is quite different from a rigid hierarchical structure in which the higher dictates any ontic status to the lower. We see no such structure in Aristotle's realm of perishable entities. It will be remembered that while the two principles are irreducible, they are so identified as "parts" of whole things that, unless one principle is set in the background of the other, they become meaningless. Furthermore, analogy is a paradoxical way of reducing the irreducible in which different things become the same. This is why, perhaps, Aristotle will feel no embarrassment in speaking of "the potentiality for acting" and the "actual possibilities" of something. Likewise, classical physicists speak of the "poised water above the dam" as "potential energy" (energeia). For that matter, "energy" itself is defined--for want of better words--as the "ability to do work." As long as analogous principles are inherent reasons of things, there can be no rigid stratification of Forms nor any oversimplified division between "real" and "unreal." Things may be more or less complete or more or less developed, depending upon the analogous application of their actual-potential structure. Furthermore, the combining and separating of elements to form different entities  

is now possible when the analogous potency-act principles permeate the elements. The pre-Socratic pluralists had rescued the cosmos from a monolithic structure by trying to explain movement in terms of the combination and separation of basic elements. It remained to be seen, however, how elements could combine to form anything that was really any different from the elements. For Aristotle the elements themselves are reducible both potentially and actually to a sameness while preserving their difference.\footnote{Ross suggests that in Aristotle's doctrine "no actual instance of any of the four elements is pure." Ross bases this claim on Aristotle's hint that privation may never be completely eliminated in the face of the contrary form of the individual. \textit{op. cit.}, p. 369.} In his classic ambivalence, he writes: "In one sense the potentiality for acting and being acted upon is one... and in another sense it is not."\footnote{\textit{Meta.}, IX 1046 a 20-21.} And again: "Things are not all said to exist actually in the same sense but only by analogy."\footnote{\textit{Meta.}, IX 1048 b 7.} Thus Aristotle rather neatly assimilates the Ideas of Sameness and Difference in Platonic thought into his explanations of perishables without 1) having recourse to separate forms; and 2) without resorting to the mythical language of Plato's world-soul.\footnote{cf. \textit{Timaeus}, 30 b.} Concerning the latter, Aristotle had repudiated the myth-device early in the \textit{Metaphysics} where he criticizes Hesiod for making first principles into gods or generating archai from gods. Aristotle confesses that he cannot comprehend the meaning of the myths and, therefore, refuses...
Concerning the Platonic Forms of Sameness and Difference, Aristotle offers the view that the harmony and/or proportion of things need not be explained in terms of something extrinsic to the perishables. Plato had indeed realized that unless knowledge involves some kind of organized unity (Sameness), then a plurality of different things appears meaningless. Now, Aristotle further contends if one's explanations are to be in any way meaningful, the organized unity must be, in some way, an acknowledgment of the plurality itself. This is true when considering any plurality of parts constituting individuals as well as any plurality of entities grouped into classes. In either case, principles involve both the sameness and difference which allow 1) different elements to be somehow the same in all individuals; and 2) different individuals to be the same in a genus. Indeed it may well be that the analogical principles can reduce generic differences to one by analogy. For under the rubric of analogy, principles seem broader than genera. In discussing the "various meanings" of "one" in the Metaphysics, Aristotle states that some things can be "one" numerically, formally, generically and analogically. This latter type of "oneness" always includes the generic "oneness" although the converse need not be true. "Such things that are one analogically are not all one generically." The analogical principles cut across generic classifications. "For there is analogy

129 Meta. III, 1000 a 10-18.
130 Meta. V, 1017 a 1-3. cf. also Topics 108 a 7-12.
between all the categories of being, whereby things that differ even generically can be the same by analogy. Sameness and difference as analogically contained within irreducible principles are thus able to reduce all differences under a common bond while at the same time guaranteeing the differences of a plurality of things.

This analogical character of the principles which runs through all of Aristotle's philosophy in many ways sets him off in bold relief from the Platonic and Neo-Platonic view of reality as hierarchically structured—a view which dominated much of the ancient and medieval outlook.

Now, precisely what is the source of Aristotle's notion of analogy? In what way does it explain both sameness and difference? How do the analogous principles allow for a hierarchy of things different from the structured reality of Platonic thought? And, finally, in what way—if any—does Aristotle's structure approximate the more modern and contemporary views of reality as evolutionary or in process?

Concerning the source of the analogy theory in Aristotle, it seems no different for Aristotle, as well as for anyone else, that the past contains the roots of the present. While Aristotle's view of analogy may be properly his own view, the theory itself has a history. To trace that history would be a task not relevant to our present explication of Aristotelian principles. Suffice it to say that the main drift of analogical thinking in pre-Socratic thought seems to flow around the idea of mathematical proportions and the

\[131\text{Meta. XIV, 1093 b 19.}\]
concept of harmony. Plato continues this thinking, especially in the
Timaeus, where the elements are proportioned mathematically so that
"fire is to air as air is to water as water is to earth." Not only is
quantitative, arithmetical proportion assigned to the elements, but there
is also the more qualitative geometric patterns whereby fire is a pyramid,
earth a cube, air an octahedron and water an icosahedron. Furthermore,
Plato has his world-soul myth inject sameness and difference into the pro-
portionately conceived elements. Aristotle assimilates this notion of
sameness-and-difference-in-proper-proportion by leaving off the mythical
language and by enlarging the mathematical type of analogy so that it can
apply in a much broader way. But the basic concept seems to have grown
out of a mathematical view, or at least analogy lends itself very nicely
to mathematical expression. In the Poetics when Aristotle is classifying
"nouns" and indicating how one may be substituted for another, as in
metaphor, he explains analogy as possible "whenever there are four terms
so related that the second is to the first as the fourth is to the third." Mathematical proportions offer clear examples of analogies, but Aristotle
in no way wants to restrict analogy to numbers which would reduce things
to numerical values. In speaking of "justice" in the Ethics, he writes:

132Timaeus, 32 b.

133In a way these patterns approximate the spatial patterns of
carbon compounds in organic chemistry.

134Poetics, 1457 b 16-17. Aristotle seems to be using the more
general notion of analogy to explain how metaphors are possible so that
all metaphors are a kind of analogy, but not all analogies are metaphorical.
Justice is therefore a kind of analogy for analogy is not a property of numerical quantity only, but of any quantity, proportion being equality of ratios and involving four terms.\textsuperscript{135}

In addition to freeing "analogy" from pure mathematics and geometry, there is also significance in the expression "equality of ratios" (\textit{isotes logon}). Analogy, which may now be applied to any number of things, is seen as a relation of a relation. If sameness and difference are to be applied simultaneously throughout the realm of perishable things, then there can be no direct comparison of sameness to sameness. That would be no comparison at all but rather a univocal identity (Parmenides). Neither can there be a direct comparison of difference with difference for neither is this a comparison (which needs some similarity), but rather a juxtaposition of two equivocals (Heraclitus). For example, in a direct "comparison" of "sameness," the expression "Plato is the same as Socrates" would identify Plato and Socrates as one being. On the other hand, a direct "comparison" of difference, "Plato is different from Socrates," would differentiate the terms beyond comprehension (assuming that the meaning of one of the terms is known). Only in an analogy—an indirect comparison or a relation of a relation—can both sameness and difference be preserved. Therefore, the expression "Plato is both the same as and different from Socrates" is explained by the proportion of entities and their principles. Such as, Plato is to his principles (basically act-potency) as Socrates is to his principles. Thus with the four-term, indirect comparison,

\textsuperscript{135}Nic. Eth., 1131 a 30-34.
no two individuals have actualities that are completely the same or completely different, nor are their potentialities quite the same or different. Things are both same and different. Following Aristotle's classic expression, we may say that in one sense they are the same; in another sense they are different.

Does the analogical character of principles explain a hierarchy of beings? Is there a "great chain of Being" in Aristotle's thought? Is it a Platonic hierarchy which ultimately rests in separate entities? Can Aristotle's hierarchy (if there is one) be in any way compatible with the "process philosophy" of contemporary thinking? The Platonic notion of a hierarchical structure that was passed on to Aristotle had both epistemic and ontic characteristics that are distinguishable but not necessarily separable: first, one's knowledge of such a hierarchy begins with the ens realissimum. There is no better way to begin than with highest knowledge of the highest being--Plato's idea of the Good, or later "The One" of Plotinus, or Spinoza's Deus sive Natura. To say that "The One" is the logical starting point does not necessarily mean that initial awareness must be of the most perfect "One." Rather it means that in the order of cognitional value, there is no greater certitude available than the certitude obtained in knowing "The One." Because "The One" is most real, it is most knowable; and it is the notion of "reality" which exhibits the ontic side of the hierarchy. In a Platonic and Neo-Platonic hierarchy, individual "things"

136 Many classifications of "types" of hierarchies have been offered. Boas suggests hierarchies of power, logic, value and reality. Op. cit., pp. 85-92. Our own main concern involves all of these but with emphasis on the ontic type of hierarchy--Reality--with its concomitant logical formulation.
which are viewed apart from "The One" (e.g., physical sensibilia) are not real on-their-own, so to speak. The type of reality which they enjoy depends upon the next highest reality which in turn looks above itself for its very reason for being; until, finally, everything's reason for being rests on the ens realissimum which explains why things are and are known.

"In like manner, the Good may be said to be not only the author of knowledge to all things known, but of their being and essence and yet the Good far exceeds essence in dignity and power."137 It seems as though the Good by some kind of natural necessity brings forth entities lesser than itself. Since the world comes from the Good, it is the best of all possible worlds; and, in order to be the best of all possible worlds, there can be no gaps, everything is filled in. No "stuff" is left over; no possibilities go unfulfilled.138

Plotinus is very emphatic in describing "The One" as a necessary producer of others which spurt out of the overflow of "The One's" perfection because it cannot "remain shut up in itself."139

137 Plato, Republic VI, 509 b.

138 Cf. Timaeus, 29 e. N.B. Leibniz's law of continuity completes this hierarchical view. There are no gaps or leaps in the order of actual beings from the most perfect to the least perfect. Just as in mathematics there is proportion (direct or indirect) that mutually adds to or takes away from, and as in physics, what increases speed decreases rest and conversely, so, too, with real substances whenever there is a loss of perfection, there is a simultaneous gain. There are no gaps in the scale of being. Cf. G. Leibniz, On the Principle of Continuity, Selections, ed. P. Wiener (New York: Scribner Press, 1951), pp. 184-188; also, Letters to De Volder, p. 157-158.

139 Enneads V, 4 l.
Thus conceived, the "great chain of Being" is forged with each link representing a level of reality ranging from the most real to the least real. Also, it is a linear chain and not a self-perpetuating circular one. It is one directional, i.e., reality flows in one direction only--from the top down.

Undoubtedly, the meaning of "real" and "unreal" is the point of issue in attempting to compare Aristotle's structure of reality-through-principles with the Platonic and Neo-Platonic hierarchy. The latter schools of thought seemed quick to associate "unreal" with "change" and "real" with "permanence." Aristotle, while still maintaining these distinctions in many ways, modifies this either-or view quite drastically. His principles of potentiality, substratum, privation allow the term 'unreal' to be predicated in such a way as to connote "not fulfilled" or "incomplete." Once "actuality" and "form" are realized, however, then there is no question of "real" or "unreal" in the rigid sense of "being or not-being," i.e., any one thing is no more "real" or "unreal" than any other thing. Individuals are real. They may have similarities that allow grouping and specification, but the individual entities "such as Socrates and Coriscus, are the real existences" and not the groupings and/or the species.\textsuperscript{140} Aristotle's prime mover which seems so necessary as the source of motion appears to be entirely removed from the existential scene in which "natural things" are viewed as having an on-their-own status, e.g., minerals, plants, animals and men. These entities constitute the realm of nature according to Aristotle. However,

\textsuperscript{140}\textit{De Partibus Animalium}, 644 a 23.
"existence" also includes the subnatural artifacts and the supernatural heavenly bodies. While these existents are arranged hierarchically, the question here is whether or not Aristotle's hierarchy is based on existential dependence upon an ens realissimum.\textsuperscript{141}

Aristotle assumes the existential aspect of the changing plurality and explains their "not-being" in terms of potentiality.\textsuperscript{142} He is not constrained, therefore, to assign epistemic or ontic priority to "The One.

We might recall that "actual knowledge is of the individual" and that "universals as such do not exist." Aristotle would rather begin with "the many," as he does in the \textit{Physics} and the \textit{Metaphysics}, and see where one might be led. "They (the Platonists) should have investigated this question: How is it that relations are many, and not one? . . . He (Plato) should ask how it is that things generally are many."\textsuperscript{143} And, of course, Aristotle's detailed work in the classification of biological specimens does not concern itself with any kind of ens perfectissimum.

Nevertheless, Aristotle does have some kind of hierarchical structure or scala naturae as Ross calls it.\textsuperscript{144} Lovejoy suggests three

\textsuperscript{141}Arthur O. Lovejoy, who treats of this "great chain" notion quite thoroughly, claims that "Aristotle's God generates nothing . . . the unmoved mover is no world ground, his nature and existence do not explain why the other things exist, why there are just so many of them, why their modes and degrees of their declension from the divine perfection are so various." Cf. \textit{The Great Chain of Being} (New York: Harper and Row, 1960), p. 55.

\textsuperscript{142}\textit{Meta.} XIV, 1089 b 16-25.

\textsuperscript{143}\textit{Meta.} XIV, 1089 b 11 and 23.

\textsuperscript{144}W. D. Ross, \textit{Aristotle} (New York: Barnes and Noble, 1964), p. 114.
scalae: 1) a vague ontological hierarchy; 2) a zoological hierarchy; and 3) a psychological one. Concerning 2) and 3), there seems little doubt of a structural reality relating the lower to the higher. In his biological classifications, eleven types of sanguinous creatures are distinguished, the lowest being the zoophytes which are spontaneously generated, and the highest being man. Man's psychic constitution admits of its own hierarchy of powers. After giving his characteristic introduction, "the word 'living' is used in many senses," Aristotle distinguishes the vegetative, animal and rational forms of life. Aristotle recognizes the problem: in terms of what the soul can do (powers of the soul), not all living things are the same. Yet there ought to be a way in which one definition might serve; for just as "rectilinear figure" serves to explain generally the quadrilateral and pentagon, etc., so "soul" can be fit into one definition even though it is realized differently in different things. Furthermore, just as the triangle is implied in a quadrilateral, so also the nutritive soul (vegetative functions) is presupposed by animal life, which in turn is implied in rational life. "We must then inquire in each case, what is the soul of each individual, for instance of the plant, the man, and the beast. But we must also consider why they are thus arranged in a series." This hierarchical

145Lovejoy, op. cit., p. 59.
146De Generatione Animalium, 732 a 25; 733 b 16.
147De Anima, 413 a 22.
148De Anima, 414 a 29-35.
149De Anima, 414 b 35; 415 a 1-2.
series in which the highest function of the lower form of life coincides with
the lowest function of the higher form of life, nevertheless, is given some
kind of definitive unity since:

> It is clear that there must be a single definition of soul,
just as there is of rectilinear figure; for as in the latter
case there is no figure besides the triangle and those
that follow it (i.e., quadrilateral, pentagon, etc.), so
there is no soul besides those we have mentioned.¹⁵⁰

First of all, what can be made of the hierarchical structure of
Aristotle's classification of animals? There seems to be no ground to in-
terpret the classification as a rigid and inflexible structure of a "once and
forever" character given to the particular animals of a class. Aristotle
seems reluctant to postulate any grandiose scheme which would exclude
modification or revision. However, he does observe that within a frame
of reference certain animals have determined attributes that allow them to
be classified, and the classification does take on a "linear series" char-
acter. But even here, the notion of "analogy" is basic. Aristotle notices
that animals that are "more or less identical," e.g., various birds can be
put in one class and this class compares analogously with other classes.

For example, the feathers of a bird may be analogous to the scales of a fish.

Groups that only differ in degree (birds with short feathers—
long feathers), and in the more or less of an identical
element that they possess, are aggregated under a single
class; groups whose attributes are not identical but anal-
ogous are separated . . . such analogies can scarcely,
however, serve universally as indications for the formation
of groups, for almost all animals present analogies in
their corresponding parts.¹⁵¹

¹⁵⁰De Anima, 414 b 20-22.
¹⁵¹De Partibus Animalium, 644 a 16-22.
Understanding and communication seem to require certain logical classifications, but Aristotle's view of the real-as-basically-analogous will never allow the classifications to distort a certain "overlapping" of the classes. "Things pass so gradually from the inanimate to the animate that their continuity renders the boundary between them indistinguishable."\(^\text{152}\)

In the *Metaphysics* he notes: "Things are said to be continuous whenever there is one and the same limit of both wherein they overlap and which they possess in common."\(^\text{153}\)

And again: "All things are arranged in order in a certain manner, but not in the same manner--birds and beasts and plants. They are not disposed in such a way that there is nothing which relates one to another."\(^\text{154}\)

Aristotle's logical classifications should not distort his ontological analogies. His classification of animals is no more "rigid" and "fixed" *mutatis mutandis* than the classifications (Phyla, Classes, Orders, etc.) of the modern biologist.\(^\text{155}\)

An analysis of the "psychological hierarchy" reveals the role of the analogous actuality-potentiality principles in a clearer light. First of all,

\(^{152}\) *Historia Animalium*, 588 b 12.

\(^{153}\) *Meta.* XI, 1069 a 5.

\(^{154}\) *Meta.* XII, 1075 a 17.

\(^{155}\) Concerning classification in Aristotle, Woodbridge writes: "The categories are what the investigation culminates in. They are ends reached and not beginnings which constrain the inquiry." F. J. E. Woodbridge, *Aristotle's Vision of Nature*, ed. J. H. Randall (New York: Columbia Univ. Press, 1965), p. 35. On this point Whitehead had remarked: "It is notable that no biological science has been able to express itself apart from phrasology which is meaningless unless it refers to ideals proper to the organism in question. This aspect of the universe impressed itself on the great biologist and philosopher, Aristotle." Cf. *Process and Reality* (New York: Harper and Row, 1960), p. 128.
any consideration of "the soul" apart from the principles of actuality and potentiality is unthinkable, as a reading of the De Anima discloses. The soul is defined in terms of actuality, and actuality must involve a reciprocal potentiality.

"The soul may be defined, therefore, as the first actuality of a natural body potentially possessing life."\textsuperscript{156}

He then explains his definition in more detail: "For the actuality of each thing is naturally inherent in its potentiality, that is, in its own proper matter. From all this it is clear that the soul is a kind of actuality or notion of that which has the capacity of having a soul."\textsuperscript{157}

Furthermore, Aristotle is quick to remind us of the analogous character of actuality and potentiality. He carefully establishes "soul" as a kind of substance (ousia) insofar as it is the "form" (eidos) of a natural body with the potentiality for life. Next, he establishes the "substance" as a kind of actuality (entelech\v{i}a).\textsuperscript{158} "But actuality has two senses, analogous to the possession of knowledge and the exercise of it."\textsuperscript{159} It is the former, i.e., "having life" or "being alive" that best describes the

\textsuperscript{156}De Anima, 412 a 26.

\textsuperscript{157}De Anima, 414 a 25-29.

\textsuperscript{158}It is interesting to note that Aristotle uses entelech\v{i}a instead of energeia to denote the kind of actuality that is the soul. The classic etymology of entelech\v{i}a as "to have (echein) an end (telon)" and, hence, "realization" is rejected by C. H. Kahn. Kahn thinks that entelech\v{i}a is an abstract noun derived from the adjective enteles meaning "perfected" or "completed." (Cf. Aristotle's Vision of Nature by Woodbridge, editorial assistant C. H. Kahn, op. cit., p. 36 n.) At any rate, the use of entelech\v{i}a seems consistent with the analogical aspect as Aristotle wants to indicate the analogous way in which living things are "actual."

\textsuperscript{159}De Anima, 412 a 21.
soul as entelechia. Thus it (soul) presupposes no other principle; it is "first actuality." For Aristotle, there was no question of the basic unity of the living individual--the "insouled" bodily being. "One need no more ask whether body and soul are one than whether the wax and the impression it received are one." Actuality and potentiality are but "principles" of beings. As such, they are the general expressions of being into which individual entities are given some primary significance. However, within this general framework "We must inquire in each case, what is the soul (act of being alive) of each individual." Aristotle never allows his rational, general formulations to obscure the explication of real individuals. Soul as the entelechia--the being alive--is different in different things, i.e., living things differ from one another. Yet they are living things that differ, there is an element of similarity or sameness. The principle of life is analogous. Sameness and difference are realized together. The series of living things shades together; life-activities of plants (growth, nourishment, reproduction) are presupposed by the animal, not as plant life but as animal life. The animal grows, nourishes itself and reproduces its species analogous to the plant functions. The animal, of course, does more: it is aware of its surroundings, not merely as tropic awareness but some sort of conscious awareness analogous to the plant's "awareness." The human being, in turn, presupposes all of these vegetative and animal processes analogous to his peculiar mode of being alive. Aristotle's analogous scale

160De Anima, 412 b 5-6.

161De Anima, 414 b 35.
of life would fare favorably with certain contemporary thinkers. For example, Aristotle's analogous "tree of life" may serve in some way as a foreshadow of Teilhard de Chardin's evolutionary notion of "complexification" which involves the gradual development of organic life from bare matter toward mind. "We must infer the presence of potential mind in all material systems, by backward extrapolation from the human phase to the biological, and from the biological to the inorganic." Also, Whitehead speaks of the "Way of Rhythm" which "pervades all life, and indeed all physical existence. This common principle of Rhythm is one of the reasons for believing the root principles of life are, in some lowly form, exemplified in all types of physical existence." Whitehead attempts to combine logical classifications with real process and development in describing "the primitive function of Reason in animal life," and he bases the description on "the analogy of a living body with its own self-contained organization, to the self-contained physical organization of the material universe."

All of this is not to make Aristotle a "process philosopher" merely to be in step with more recent thinking. Rather, the point is that there is much in the structure of the cosmic being of process philosophy today that can be traced to the type of hierarchies in Aristotle. Because of the basic analogical nature of his principles (reasons for being), Aristotle's hierarchical view of reality is not merely composed of horizontal levels or strata of

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classes in which one class is sharply divided and separated from the class above and below it. On the contrary, analogy allows for a kind of vertical continuity which cuts across the horizontal levels of being linking analogously the hierarchy of classes. In addition, it would seem that the basic "sameness" and "difference" of the principles operate on both planes. Horizontally there is "sameness" which makes classification possible in the first place, but there is also the variants or differences of individuals within the class. Vertically there is the "difference" of the classifications as they ascend from the lower to the higher, but there is also the all pervading likeness which makes the scale of ascent a continuous one. We can now, perhaps, return to an above quotation including, however, more of the text which should now have greater significance:

Nature proceeds little by little from things lifeless to animal life in such a way that it is impossible to determine the exact line of demarcation, nor on which side thereof an intermediate form should be. Thus, next after lifeless things in the upward scale comes the plant, and of plants one will differ from another as to its amount of apparent vitality; and, in a word, the whole genus of plants, while it is devoid of life as compared with animal, is endowed with life as compared with other corporeal entities. Indeed, as we just remarked, there is observed in plants a continuous scale of ascent towards the animals. (Emphasis mine.)

It would be inaccurate to speak of a "hierarchy of beings" or a "great chain of Being" in Aristotle's thought unless one distinguished and

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165 Aristotle implies that individual differences make it impossible to give an ultimate classification of animal forms by a logical process of dichotomy. Cf. De Partibus Animalium, 642 b 5; 644 a 10.

166 Historia Animalium, 588 b 5-11. Cf. also De Partibus Animalium, 681 a.
then combined this hierarchy of horizontal levels and the vertical continuity. These two planes can again be distinguished in terms of a "more logical" and "more ontic" point of view. The horizontal structuring according to "sameness" involves the grouping of individual things into classes so that the logical structure is emphasized, whereas "difference" on this plane is found among the actual individuals (an ontic point of view). The vertical continuity, on the other hand, emphasizes the "sameness" of individuals (ontic) while recognizing the "difference" of classes (logical).

**Analogy**

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<td>Individuals</td>
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<td>(ontic)</td>
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It would also be inaccurate to assume that the diagrammatic expression of Aristotle's analogous realm of perishables defines that realm in a fixed and permanent way. If such were the case, of course, it would not be an analogous realm of perishables. The difficulty arises in any attempt to explain and, in a sense, "fix" the continuous scale of beings in Aristotle's philosophy in which the very central notion--"analogy"--defies "fixing."

The vertical continuity that cuts across hierarchical levels of the perishables should not imply the kind of two-dimensional "perfect figure" as completely filled, which the schema may suggest. This is not a realm in which "everything has its proper place." Aristotle's structure of nature has gaps in it; there are unfulfilled possibilities (in things), spontaneous
events, chance occurrences. There is no "principle of plenitude" in this structure. "The potential need not necessarily become actual."167

"That which exists potentially may not exist."168

The language here need not suggest "a world of unactualized possibles" which has little meaning in strict logical terminology.169 It was already noted that Aristotle refused to consider the act-potency principles apart from concrete conditions in which the principles are mutually corelated.

"Potentiality," by itself, is not an explanatory principle. As is his custom, Aristotle wants to specify objects in the light of general principles. The general expression "to be potential" assumes an actual state of affairs--"to be potentially this"--e.g., an actual unhealthy man who is potentially healthy, etc. Potentiality can only be uttered in terms of what is actual, and what is actual is specified and conditioned.170 For Aristotle, therefore, 1) it is inconceivable to "separate" actuality from potentiality in one's view of perishable entities; and 2) as principles of concrete individuals, they are always specified by some immediate circumstances and conditions. With these notions in mind, then, Aristotle's "possibilities that go unactualized" always refer paradoxically to real possibilities. That is to say, possibilities of real things and not a logical or ideal realm of unactualized possibilities allow Aristotle to avoid any separate and distinct realms, the one an actual realm and the other a potential. Also, Aristotle's thought seems to run counter

167Meta. III, 1003 a 2.
168Meta. XII, 1071 b 19.
169 Cf. Quine, op. cit., p. 4.
170Meta. IX, 1048 a 25-35; 1048 b 1-10.
to the rationalistic notion of "the best possible world." For Aristotle, nature makes mistakes. We know this from the analogous realm of the human arts. People make mistakes--writers in composing, physicians in diagnosing--"so that analogous failures in nature may evidently be anticipated as possible."171 In one sense, "nature does nothing in vain" insofar as ends are striven for and the necessary functions are provided to continue the species. There is purpose or finality in nature, but there is no guarantee that the particular end aimed at by a particular being must be attained.

"Nature does nothing in vain, and does not omit what is necessary, except in deformed or imperfect animals."172 These "failures of nature" are "failures of purpose," occurrences in which ends aimed at are not achieved. "Thus if in art there are cases in which the correct procedure serves a purpose and attempts that fail are aimed at a purpose but miss it, we may take it to be the same in nature, and monstrosities will be like failures of purpose in nature."173 There are two technical terms which Aristotle uses to indicate their "missing of the mark." On the human level (i.e., involving deliberate choice, hence excluding beasts and children), it is called *tychē*--"luck" or "fortune"; on the level of "nature" that does not act deliberately towards goals, it is *automaton*--"chance" or "spontaneity." Such occurrences will not allow Aristotle's notion of what-there-is in reality to be given a strict and rigid rationalistic interpretation of a hierarchical arrangement that either

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171 *Physics* II, 199 a 34-35; 199 b 1.

172 *De Anima*, 432 b 21-22.

173 *Physics* II, 199 b 2-5.
admits of no hidden exceptions or explains them away. For Aristotle, chance events cannot be reasoned away precisely because they are outside the scope of rational causes. We know things best when we know the causes and principles, but "chance" is not a cause. Chance events involve the absence of a cause, viz., final cause; chance events are ateleological. Events happen by chance, indeed, but chance is not a cause. According to Aristotle, the reason why chance events cannot be calculated in advance is due to the nondirectional character of chance happenings. Basically, nature is directional; most things aim at and achieve certain ends in a regular and orderly process so that we can expect and anticipate what ends will be attained in the future. But because chance involves the absence of finality, there can be no apparent reckoning of chance events. "This is why we are justified in saying that τυχή cannot be calculated; for we can calculate only from necessary or normal sequences, and luck acts outside such."174

Yet Aristotle, in typical fashion, suspects that it is an oversimplification to oppose "chance" to "final cause." He goes on to say that in one sense—an absolute and unqualified sense—it is true that "τυχή is not the cause of anything."175 In another sense—the qualified sense in which chance is a by-product of ordered events—"chance is an incidental (συμβεβηκός) cause."176 And again, in one sense chance events cannot be anticipated and calculated (since, as we saw, chance events are outside of

174Physics II, 197 a 19.
175Physics II, 197 a 15.
176Physics II, 199 b 23.
causal sequences); but in another sense, chance events can be anticipated and expected (by analogous situations of failure in the arts). Considering all of these "senses" of 'chance,' there is, perhaps, both a twofold strength and a twofold weakness in Aristotle's concept of chance, depending upon which "sense" is stressed.

First of all, the strength of common sense seems to be with Aristotle. The terms 'luck,' 'fortune,' 'chance,' 'accident,' as they are understood today, coincide with his notion of the unforeseen and unintended. Secondly, Aristotle seems to give a sound basis for distinguishing the normal from the abnormal in nature in terms of the general notion of nature as goal directed through causality. What is more, finality as principle and not as entity is part and parcel of the real world of changing things and not separate from it. However, from another point of view, Aristotle's shortcomings might be exposed. In the first place, since chance is indeterminate and non-causal for Aristotle, it cannot become involved in "scientific knowledge." However, in the modern concept of statistics one can calculate the probability of the "indeterminate" and thus give to it a certain amount of determination. Also, it is conceivable that Aristotle's view of chance events could lead to a fatalistic surrender to inexplicable chance phenomena which, because of their deviation from the normal final causes, remain outside of


178Post. Ana., 87 b 19.
the sphere of explanation and must be simply accepted. I do not think that
this last interpretation is completely consistent with the Aristotelian spirit
of constantly searching for causal factors which—in this case—would tend
to reduce "chance" happenings as we acquired more knowledge.

At any rate, the basic analogous character of chance occurrences
which are inseparably linked with the principles (act—potency, efficiency—
finality), together with the previously stated notions of unfulfilled
capacities, all serve to indicate that the hierarchical edifices in Aristotle's
philosophy are loosely constructed. There is a basic analogical character
rooted in principles that runs through the logically conceived structures;
and unless the analogous principles are recognized, the hierarchies of
"beings" become fixed and immobile, in which case the structure would not
be Aristotelian.
III. PRINCIPLES AND THE REALM OF "IMPERISHABLES"

We have seen Aristotle's attempt to render a realm of perishable entities as meaningful come to rest in explanatory principles. Matter, Form, Privation, Actuality and Potentiality are conceptual expressions grounded in a concrete world of beings analogically structured in a basic setting of "sameness" and "difference." Through the explanatory technique of the archai (especially the principle of potentiality), Aristotle hopes to avoid both the rigid dichotomy of a Parmenidean "Being versus Nothingness," and an inexplicable and random "flux" world that might be attributed to Heraclitean doctrine. In rejecting a unilateral approach, Aristotle finds merit in the pluralistic attempts of Anaxagoras and Empedocles but ultimately revamps their archai into his own unique system whereby nous not only imparts motion to what there is but sustains that motion; and the elements of Fire, Earth, Air and Water are further explained in terms of more basic principles. Aristotle accepts the Pythagorean number theory insofar as numbers are not separate from individuals but are grounded in concrete reality. He ultimately rejects numbers as archai, however, because of their quantitative and, hence, non-irreducible character. Aristotle criticizes the use of number as an archē inasmuch as quantity admits of division and, hence, cannot be prior or first in terms of being and being known.\footnote{Meta. XIII, 1083 b 8ff.} Had he continued
the work of Pythagorean theory, perhaps, the evolution of the word "science" as the quantitative analysis of physical reality would have been hastened. As it happened, Aristotle's own particular world vision saw reality as neither wholly univocal (what is given in numerical values) nor as equivocal. Aristotle's world is analogous and, hence, basically qualitatively structured. While Platonic Forms seem to offer a more qualitative explanation of the world, they are dismissed as being too "separate" to explain anything. In such a way, Aristotle surveys the short history of Western Philosophy and molds the thoughts of his predecessors into his own unique system of the real which is rendered intelligible in terms of his archai. Aristotle makes it very clear that "principles" are the key to a philosophy. "Principles" are what his predecessors sought, and they are what he sought.  

For "principles" are the "reasons why" things are the way they are, and nothing can be more important to a lover of wisdom than discovering the basic reasons why. 

In taking his lead from the philosophical past, Aristotle begins with the reality of common experience. It was and is a world of sunshine and rain, winter and summer, mountains and seas, earth and sky. To live this real life of events was one adventure; to attempt to explain it was, perhaps, another. And in the explanations offered by these first lovers of wisdom, there appears to be (at least to Aristotle) a certain discrepancy in the relating of the explanations to the things explained. First of all, there is the problem of what is to be explained. There seems to be no over-all category into which everything will fit. We hope for a science of "being qua being," but

2Meta. I, 983 b 1-5; Meta. IV, 1003 a 29-30.
"being is used in various senses." Is the "being-of-the-sun" the same as the "being-of-the-tree"? The latter manifests a coming-into and passing-out-of "being"--it is perishable (φαρύς) whereas the former is steadfast, manifesting a constancy--it is imperishable (ἀφαρύς). This distinction of what there is to be explained casts a shadow over what explanations are to be used in reference to what there is. Aristotle first states the problem succinctly:

We must consider and apply ourselves to the question... whether the principles of perishable and of imperishable things are the same or different; and whether all are imperishable, or those of perishable things are perishable.  

Aristotle develops the problem at length and expresses his amazement that no previous thinker had seen the problem of trying to explain different kinds of beings by means of the same principles. Even Empedocles, whose pluralism should have led him to the problem, is a disappointment. The problem is this: If principles are the same, then what is the basis for distinguishing perishable from nonperishable entities? On the other hand, if principles are different, then in what way are they different? If the principles are different, it must be assumed that perishable entities are explained by perishable principles and imperishable entities by imperishable principles; but if principles are perishable, can we really speak intelligibly of perishable entities? If this leaves only the other alternative of just

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3Meta. III, 996 a 2-5.
4Meta. III, 1000 a and b.
5Meta. III, 1000 a 25ff.
imperishable principles, then we are caught in the first problem of explaining why something is perishable.

On the one hand, Aristotle wants to hold on to the objective predominance of "things that come and go." His common sense realistic approach wants to embrace the "perishable realm." Yet the explanatory, subjective side of "principles" seems to demand an immutable, universal, imperishable character. He dismisses quite readily the possibility of "perishable" principles but refuses to deny the reality of perishable entities, in fact all of his discussions begin here. Aristotle would have, then, a philosophy whose prime concern is with the developing of imperishable principles of perishable entities.

To be sure, Aristotle has a realm of imperishable entities—the celestial bodies. In considering this realm of Aristotle's philosophy, we shall explore: 1) what the differences are between the perishable and imperishable realms; 2) whether or not there are any similarities between the two realms; and 3) (cutting across both these questions is the problem central to this paper) what role Aristotle's theory of principles plays in linking and/or separating the perishables from the imperishables.

Also in discussing the imperishable realm, we shall lead up to but exclude the Prime Mover (or Pure Act or Nous) from the realm of the natural. In his well-known passage in which the three kinds of ousia are named—

1) sensible and eternal; 2) sensible and perishable; 3) nonsensible and immutable—Aristotle concludes: "The first two kinds of substance come

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6Meta. XII, 1069 a 30-35.
within the scope of physics, since they involve motion; the last belongs to some other science, if there is no principle common to all three."  

THE DIFFERENCES BETWEEN THE TWO REALMS

The differences of the two realms would seem to exclude any common principles and, therefore, any common science. The realm of what-comes-into and passes-out-of being, first of all—by the very fact of its generation and corruption—admits of a formal change, i.e., a substantial change. Whatever is perishable has some kind of beginning and end; the imperishable entities, on the other hand, are eternal, having neither beginning nor end. Furthermore, the perishables increase and decrease in size (quantitative change), whereas what is imperishable is immutable, neither increasing nor decreasing. Again, the perishables suffer affections of various sorts (qualitative change), while the imperishable realm is qualitatively static.

Perhaps the most radical difference between these two realms is witnessed in the spatial changes of local motion (kinesis rather than metabole). The motion of the sublunar perishables is rectilinear; and, as such, there is the imperfect tendency to run off into infinity, i.e., to be boundless and indeterminate. Thus, fire, being absolutely light always

7Meta. XII, 1069 a 35; 1069 b 2. N.B. There is no science of the Prime Mover. It does not admit of explanation through principles. It is the principle beyond explanation, the thinking of thinking.

8Physics II, 192 b 20.

9Physics II, 192 b 14.

10Physics II, 192 b 17; Meta. XII, 1069 b 10ff.

11Physics VIII, 260 b 15.
tends to rise (and never return); and earth being absolutely heavy always
tends to fall; while air and water are relative intermediates tending to rise
and fall respectively. 12 The mixture of these pure elements on the face of the
ever recur as
earth is fused into a realm of perishable entities which do not recur as
individuals. Individual men, individual beasts, individual trees, individual
drops of rain—all come into being and pass out of being as individuals.
The "quintessence," on the other hand, manifests a local motion that is
indicative of its eternal and immutable individuality—cyclical motion. This
cyclic recurrence of the heavenly bodies, for Aristotle, is "empirical proof"
of the "divine-like" character of ouranos. 13 Circular motion is "prior" to
rectilinear motion in that a circle is "perfect," i.e., it is self-contained,
it has neither beginning nor end outside of itself. It can be said of circular
motion that either 1) its beginning and end are contained within itself; or
2) it has no beginning nor end, strictly speaking. In any event, a circle
diffs from a line in that the former is self-contained while the latter tends
toward infinity and can never be complete. 14

The heavenly bodies, having a motion of a circle rather than of a
line, are neither heavy nor light, neither generated nor corrupted, neither
increase nor decrease in size. Rather, each heavenly body "runs always"
and forever. They are aetherial (ἀετήρικα). 15

12 De Coelo, 311 a 16ff.
13 De Coelo, 259 a 19ff.
14 Physics VIII, 265 a 21.
These aetherial bodies, because of their perfect cyclical motion, recur numerically. It is the same sun that returns in its heavenly place in the night-day sequence. Likewise, it is the same planet that circles the upper sphere. The perishables operating on a linear plane between an upper limit (sphere of the moon) and a center (earth)\textsuperscript{16} can only hope for a recurrence of species (eidos) rather than an individual, numerical recurrence. Men, animals, trees, etc. do not "return upon themselves" for their course of coming-to-be seems linear and not cyclical. The best that can be hoped for here is a cyclic regeneration of kind. In the regeneration of perishables, like begets like so that the species recur not the individual.\textsuperscript{17} Even the elements seem to imitate this cyclic recurrence in its linear movement, e.g., the evaporation and condensation of the seas in which individual drops of water come and go while the same water recurs.\textsuperscript{18}

It is this notion of the more perfect being describing a perfect (self-contained) sphere that marks the greatest distinction between perishable (phthartē) and imperishable (aphthartē) beings. All other distinctions are rendered intelligible in the light of the eternal cycles—a notion willed to Aristotle and passed on and solidified in the Ptolemaic system, and which influenced such thinkers as Copernicus and Galileo who never questioned the cyclic perfection.\textsuperscript{19}

\textsuperscript{16}De Coelo, 273 a 7-18.
\textsuperscript{17}De Generatione et Corruptione, 338 b 10ff.
\textsuperscript{18}Meteorologica, 346 b 24ff.
As would be expected, the *archai* play a basic role in explaining the different motions of "heaven" and earth. The earthly, rectilinear motion involves some principle of contrariety, i.e., an understanding of motion as tending toward an opposite place. The *archē* of privation, in this instance of local motion, takes the nature of a *terminus ad quem*. There are no such principles involved in the entities that move in a circular path.  

Aristotle rejects any opinion that rectilinear motion is the contrary of circular motion, although he does admit that: "If there is an opposite to circular motion, it must above all be rectilinear motion which is the opposite." However, a closer inspection of straight-line movement reveals that sets of opposites are contained within straight-line motion itself. "But the two rectilinear motions are the contraries of each other on account of their places, since up and down form a difference, in fact a contrary, in respect of place." In other words, when simple movement is rectilinear, it contains its own set of contrary principles. To posit, therefore, that circular movement is the opposite of straight-line movement is to destroy the concept of simple motion or destroy the meaning of contrariety. Aristotle will do neither. Simple motion involves one set of contraries (e.g., up and down) and no more. To deny this assumption would destroy the intelligibility of simple movement.

Perhaps, then, simple circular motion contains its own set of contraries—within itself. For example, clockwise motion may have as its

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20 De Coelo, 270 b 32; 271 a ff.
21 De Coelo, 271 a 1-4.
22 De Coelo, 271 a 5.
opposite counterclockwise motion. Aristotle, likewise, rejects this type of contrariety in the heavenly spheres. 23 First, he shows that when a body is referred to as moving from one point to another (a to b), it must be moving in a straight line since there can be "an infinite number of circular paths through the same two points." 24 Secondly, the principle of finality will never allow contrary motion to take place in the circular motion of the heavens. Assuming that one sphere moved in a circle counter to another contiguous sphere: 1) if the motions were of equal force, there would be, in effect no motion at all since the equal and opposite forces would result in a "stalemate"; 2) if one motion were weaker than the other, it would be "without purpose" since it would be pulled along in the direction of the other sphere and, hence, its (the weaker sphere) nature would be frustrated.

Aristotle assumes several significant factors in this discussion of the imperishable heavens: 1) he assumes a contiguous layer of spheres in which the outermost spheres move the innermost spheres. Contrary motion under this assumption is impossible. Nothing "opposes" the heavens. More specifically, there is no limiting principle. There is no privation in the form of an end-not-yet-reached. 2) Finality reigns supreme in this realm, whereas in the realm of perishables the end of rectilinear motion is always contrary (opposite) to the starting point. There is serious limitation in this latter realm; there is no natural necessity. To be sure, the simple elements (fire, earth, air, water) have theoretical, natural necessity of a simple movement; but the real world of perishables is not simple; it is "mixed,"

23De Coelo, 271 a 6ff.
24De Coelo, 271 a 10.
and wherever mixture is involved "action" (poiein) and "passion" (paschein) and, subsequently, "contact" (aphē) become necessary. The best that can come out of these mixtures is a cyclical regeneration of species, while individuals in this limited sphere run a rectilinear course having extreme limits of coming into being (genesis) and running an orderly course into phthora.

The aetherial bodies, on the other hand, are eternal having no limiting opposition. It would make no sense, therefore, to speak of one circular motion (e.g., clockwise) being contrary to another (counterclockwise) since the same end is reached. Perhaps it may be said that the eternal cycles have neither a beginning nor an end or that the beginning is the end. Through the primacy of circular motion, Aristotle's realm of ouranos becomes a "tight" system. Every sphere is in its proper place "moving with its proper motion." If one sphere's motion were caught up in a counter motion, it would have no purpose of its own and would be, in effect, like a "purposeless shoe which is never worn." "But God and nature create nothing that does not fulfill a purpose." There is simply too much manifest order and regularity in the heavenly bodies for Aristotle to admit anything but a universe dictated by ultimate purpose. The order of the spheres is self-contained; there can be no infinity of bodies. Aristotle offers six proofs why the heavens are finite rather than infinite, and each proof draws its premises from the concept of

25 De Gen. 322 b 20-35; 323 a 1-32.
26 De Gen. 338 a 17.
27 De Coelo, 271 a 35.
circular motion. The entire structure, including both sensible realms (physis and ouranos), is plotted in a circular way with the earth as immovable center and the outermost sphere of fixed stars, drawn from a radius from the center, constituting the upper limit. There can be but one universe, therefore, since everything would tend toward its natural place and final end. Hence, if there were earth and fire of another world, it would naturally move to the center and circumference, respectively, and would coincide with the earth and fire of this sphere.

Either, therefore, the initial assumptions must be rejected, or there must be only one center and one circumference; and given this latter fact it follows from the same evidence and by the same compulsion that the world must be unique. There cannot be several worlds.

Aristotle's assumptions in this case are based (negatively) on the absence of a limiting principle of contrary motion and (positively) on the principle of finality. Both his principle of contrariety and his principle of finality influenced future cosmologists with each adding their own points of view. For example, Nicholas of Cusa speaks of a paradoxical "coincidence of opposites" in which everything is center and circumference; or, there is no center nor circumference, depending upon one's point of view. And even in Cusa's relative shifting of reference point, the finality of God and/or Nature reigns supreme.

The second significant assumption is that local motion or change of place is viewed as a process rather than as a state of being. The process

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28 De Coelo, 271 b ff.

29 De Coelo, 277 a 10-12.

operates in terms of the act-potency principles. If movement is the transition from potency to actuality\textsuperscript{31} and if actuality is prior to potentiality,\textsuperscript{32} then "whatever is moved is moved by something else."\textsuperscript{33} That is, something cannot actualize its own potentiality. In order for change to be initiated and sustained, there must be something (the mover) which possesses the actuality toward which another thing (the moved) is merely potential. In the realm of things that are generated and corrupted, such movement demands actual "contact" (\textit{aphē}).\textsuperscript{34} The principle of movement in such beings is the passive principle needing some external agent to sustain movement.\textsuperscript{35} In the realm of the aetherial bodies, the motion is prompted by degrees of desirability, concluding with the most desirable cause of all motion, PURE ACT.\textsuperscript{36} No matter how analogous may be the comparison of Aristotle's two realms (this comparison shall be dealt with), the primary motion, local motion, is a process of moved movers with the only inherent principle of motion being a passive capacity of motion which must be actualized from without.

It is curious to note that for Aristotle, while movement is a process, knowledge is a state, whereas the contemporary view tends to view movement

\textsuperscript{31}\textit{Physics} III, 201 a 11.
\textsuperscript{32}\textit{Meta.} IX, 1049 b 12.
\textsuperscript{33}\textit{Physics} VIII, 259 a 30; \textit{Meta.} XII, 1073 a 25.
\textsuperscript{34}\textit{De Gen.} 322 b; 323 a ff.
\textsuperscript{35}\textit{Physics} VIII, 255 b 30; 256 a 1-5.
\textsuperscript{36}\textit{Meta.} XII, 1072 a; 1072 b ff.
as a state (inertia) and knowledge as a process. We have already seen how Aristotle's actuality and potentiality principles rendered movement as a process. The same principles explain knowledge as a kind of state. The highest kind of knowledge (theoria) involves a state of actuality. Basically, of course, thinking involves more of the actual than it does the potential; so that when a state of mind is reached, there is a kind of cessation of human motion insofar as the passive limits of motion are concerned. It may seem ironic to speak of knowledge as Act and, at the same time, to equate it with the cessation of movement; but Aristotle is simply bearing witness to his predecessors and assuming that change and/or motion involve some limitation. For him, the limitation rescues that being from sheer nothingness; and he categorizes it as potential being. But, nevertheless, a human being is more fully actual when he attains to the knowledge (episteme) that puts his mind at rest. Wicksteed and Cornford point out that episteme is etymologically connected with "coming to a stand" (stenai) and that for Aristotle "intellectual states are not modifications... they consist in 'being a certain state in relation to something,' viz., the object known."  

Aristotle's principles of motion and the limitations involved will not allow episteme to be sullied by change and disruption. Knowledge (highest kind) occurs precisely when instability ceases and our minds rest on something.

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37 De Anima, 430 a 10ff.

38 Aristotle, Post. Ana., 100 a 5-10, fn. a, The Loeb Edition. Cf. also Plato, Cratylus, 437 a; Phaedo, 96 b.

Children cannot acquire knowledge nor render judgments because "their bodies are in a state of great turbulence and instability."\(^\text{40}\)

While Aristotle's view of motion as a process of moved movers has no place in the contemporary explanations of physical forces, his concept of human understanding may not be as sterile as it first appears. To call knowledge a "state of rest" need not mean that such a knowledge is the final explanation of a given reality, and that nothing more could ever be known about a given set of experiences. It may mean that the uniqueness in the human animal lies in his ability of "fix" the stream of experiences in some kind of meaningful whole. It is significant enough that Aristotle firmly grounds all human knowledge in experience (empeiria) and then acknowledges the role of memory and intellection in establishing some unity of meaning. If this is Aristotle's meaning--viz., the acknowledging of some kind of mental model which gives meaning to a flow of experiences--then he has pioneered a mighty array of thinkers whose views have dotted the history of philosophy, including as well the contemporary scientist working with his mental (mathematical) models as a meaningful calculus of the observable data. One can quickly call to mind Kant's categories giving unity to the manifold of sensations; Hegel's "quiescent kingdom of laws"; Whitehead's actual occasions "fixed" in a background of eternal essence; Santayana's scepticism induced by the flux of experience and yet grounded in a belief through animal faith. There is no intention to group these thinkers (and the countless others) into an Aristotelian theory of knowledge. It is hardly

\(^{40}\text{Physics VII, 247 b 20; 248 a 1.}\)
likely that Aristotle was aware of the implications of his own theory of knowledge. How similar and yet how different philosophers are from one another remains one of the unsolved meta-philosophical problems. The intention here is to indicate the solid stance Aristotle took concerning man's cognitional relation with experience. The fact is that: 1) he acknowledges the reality and importance of enpeiria; 2) he acknowledges the reality, importance and necessity of a mental fixation of experience. And he effects all of these with but a handful of predecessors to draw from.

First acknowledging an animal ability to perceive things, Aristotle proceeds to discuss the grouping of such perceptions by the memory into a "single experience."

And experience, that is the universal when established as a whole in the psyche—the unity that corresponds to the multiple, the unity that is identically present in them all—provides the archē of art and science: art in the realm of process, science in the realm of facts.⁴¹

The generalized and mentally fixed experiences become the principle—the starting point—of art (techne, i.e., productions, manufacturing, invention, etc.) and of science, i.e., speculative learning. What is more, this growth of experiences within man's "mental life" indicates that it was an anemic life prior to the experiences. Experience nourishes man's mind with its richness; and man returns his developed structures to the world and enriches experience through the arts and sciences. There is reciprocity between man and the world of experience:

⁴¹ Post. Ana., 100 a 5-10.
Thus these faculties are neither innate as determined and fully developed, nor derived from other developed faculties on a higher plane of knowledge; they arise from sense-perception, just as, when a retreat has occurred in battle, if one man halts so does another, and then another, until the original position is restored. The soul is so constituted that it is capable of the same sort of process. 42

Knowledge (epistēmē) is indeed a state of grasping first principles, but experience has dictated the whole process whether or not those principles are referred back to experience in an exhaustive and complete sense so that it remains to be seen whether new experiences are possible. At any rate, it would seem as if the answer lies in whether or not the same principles that explain the perishables also explain the eternal structure of the heavenly spheres. Undoubtedly, this is why Aristotle is so concerned with seeing the relations between the two realms. He is amazed that no previous thinker had raised the problem. We see and attempt to understand this realm of flowing experiences; we see and attempt to understand that realm of stable entities. Can we have the same principles provide an understanding of both realms? Are the principles of perishable and imperishable things the same or different? 43

SUMMARY OF DIFFERENCES - A RETURN FROM A DIGRESSION

The type of local motion marks the most significant difference between "heaven" and "nature." The former moves in an eternal circle; the latter moves in perishable straight lines. The inherent principles of contrariety help to

42 Post. Ana. 100 a 11-15.
43 Meta. III, 1000 a 5.
establish this difference when circular motion is found to be "deprived" of a contrary principle of privation, i.e., there is no opposite to circular motion. The principle of finality also marks the heavens as distinct from a perishable realm which admits of chance occurrences and in which nature suffers "failures of purpose." The heavens manifest an order that does not miss the mark--their nature does nothing in vain.

Also, the type of motion in the different realms differs according to what sustains the process of change. Here actuality and potentiality serve as the explanatory principles of motion as a process. But in the sublunar realm, "contact" is needed to effect the desirable transition from potency to act; whereas in the heavens, there is a "desire" of natural necessity which best imitates PURE ACT itself. Almost in spite of himself, Aristotle's different realms affect his theory of knowledge. The theoria that contemplates the heavenly spheres is not the type of knowledge that depends upon an organization of "earthly" experiences. There is, undoubtedly, a tension in Aristotle's thinking. A tension wrought by his polar tendencies toward his Platonic inheritance, on the one hand, and his own apparent naturalistic tendencies on the other.

Perhaps nowhere does this tension become more pronounced than in his discussion of "movement" in the Physics. He wants to "locate" nature

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44 *Physics*, II 199 b 1-5.

45 *De Coelo*, 271 a 35.

46 In the *De Coelo*, Aristotle speaks of the natural motion of the four elements; but this seems to be a consideration of the elements in an abstract and rational manner. In the perishable realm, the elements are "mixed"; and any natural tendency must be aided by "contact."
in forms having a principle of motion, i.e., in forms that are conceptually but not actually separable from matter. Matter qua matter will not do for Aristotle since, as potency principle, matter qua matter represents mere universality; whereas it is the actual kind of thing (eidōs) which primarily indicates a being's natural state and not its universal potency.

Aristotle had first defined nature as that which contains within itself principles of motion and rest. He revises this definition in order to include matter but with emphasis still on form. Thus, nature is the form of things that have a principle of motion. Natural entities—the matter-form synelos—are inseparably bound up with motion. The principle of movement is an inherent ratio of natural, concrete entities. Aristotle is quite clear in this naturalistic commitment. One need not look beyond nature for any explanatory principles of nature. Nature is basically movement, and the archē kineseos is in and of nature itself.

However, the movement of the natural cannot seem to look any other way except up to the movement of the "super" natural—the heavenly spheres—the sensible but imperishable realm of more perfect forms. Even in this realm, it would be consistent for Aristotle to speak of the "natural" movement of the heavens, as long as the source (archē) of their motion is self-contained. It is only when the relentless upward process of motion

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47 Physics II, 193 b lff.

48 For Aristotle, universals as such do not exist—individuals are the actualities. Aristotle's problem lies in his attempt to explain (through principles) in universal terms the motion of individual entities—entities whose individuality must include matter.

49 Physics II, 192 b 14.
carries him outside of and beyond "both" natural realms does Aristotle manifest the Platonic pole of his thinking. Restricted to the movements of the sublunar and celestiai spheres, his naturalistic principles\textsuperscript{50} accomplish the task of ridding nature of the myth-form for which Aristotle had such distaste.\textsuperscript{51} Principles provide the basis for demonstration, and thus the realms of \textit{ousiai} are raised to the level of a science (\textit{epistēmē}). Nature, however, gradually seems to lose its explanatory powers as it gains its reflective image of matter-less \textit{nous}. All the hard-earned effort of including matter within the definition of changing, informed nature is lost when, at last, the ultimate \textit{archē kineseos}, the unmoved mover, is separate from nature. Aristotle applauds Anaxagoras for recognizing that \textit{nous} is itself motionless since it can only control matter if it is free from matter and motion.\textsuperscript{52} But to say this is to look beyond nature (which he defines in \textit{Physics}, 192 b 21 and 253 b 5 as principle of movement) for an explanation of nature. This seems to be the focal point of Aristotle's own criticism of Plato in that the latter had separate universals as explanatory of changing particulars.\textsuperscript{53}

Many commentators of Aristotle have cited this "tension" as a basic, irresolvable inconsistency. Solmsen asks, "Does Aristotle, in order to find the way to his first principle of movement, actually ignore

\textsuperscript{50}Naturalistic in the sense of being inherent in nature and not naturalistic in the sense of the positive sciences.

\textsuperscript{51}\textit{Meta.} III, 1000 a 19.

\textsuperscript{52}\textit{Physics} VIII, 256 b 25.

\textsuperscript{53}\textit{Meta.} XIII, 1080 b 5.
his own definition of nature?" His answer is affirmative, contending that Aristotle by appealing to an unmoved mover "takes away" much of what was lavishly bestowed upon nature, and that

When he refutes his own opinions, Aristotle is as merciless as when he criticizes the doctrines of his predecessors; the only difference is that he does not accuse himself of superficiality, vagueness, or obscurity.55

It is interesting to note that Solmsen dedicates his book to Werner Jaeger whose commentary on Aristotle, at times, makes a similar though less polemical approach to Aristotle's view of nature. Jaeger sees Aristotle as one who is searching nature in order to find justification for Plato's "supersensible reality." According to Jaeger, Aristotle comes upon the philosophical scene as a Platonic believer looking for understanding (credo ut intelligam).56 He compares Aristotle's relationship to Plato to that of Kant's relationship to the dogmatic rationalists, with this exception, that Aristotle searched for justification of an objective super-reality; while Kant searched for justification of "methodological meaning."57 It may indeed be true that Aristotle's whole approach to nature was a credo ut intelligam; that the search for a science of being qua being was to have terminated in the principle of principles, the Nous whose thinking of self makes all of sensible nature (perishable and imperishable) thinkable.


55Ibid., p. 234.


57Ibid., p. 379.
However, even granting this Platonic commitment, Aristotle's own approach to the problem—through nature—establishes firmly enough the independence of the principles of perishable things so that even if in the end a supreme, unifying principle is "demonstrated" or posited, the natural realm need not retreat into some shadowy Platonic realm of images. It was established above that the archai are basically analogous. This notion of analogicity is a curious device which both joins and separates. In its divisive role, independence is established so that "even in the natural world the principles from which these things (perishables) are derived are perfect and complete." 58 One can hardly accuse Aristotle of mollifying the role of principles and causes of the natural world simply because such a realm may imply an absolute principle. The implication is clearly there; Aristotle is hard put to explain all the order and harmony that he has found in the sensible realms if an infinity of principles is possible in which "every principle will be based upon another." 59 Yet his inconsistency does not rest in his "demonstrating" an eternal principle while attempting to "make much" of the sensible realm. Aristotle never criticizes Plato for holding to a Being apart from nature. He may, indeed, as Jaeger suggests, accept this ab initio. Rather, Plato is criticized for positing universals that are apart from nature.

58 Meta. XIV, 1092 a 15.

59 Meta. XII, 1075 b 26.
Socrates ... did not separate universals from particulars; and he was right in not separating them. ... The separation of the universal is the cause of the difficulties which we find in the ideal theory.\textsuperscript{60}

If motion and time are eternal and continuous and if what changes is divisible,\textsuperscript{61} so that the continuity can only be preserved in an immaterial something—then we can be certain that the prime mover is no universal form. If it is anything, it is a perfect, individual actuality. Universals as such are rooted in potentiality, and potentiality cannot explain the actual order of moving things.\textsuperscript{62} This is an instance in Aristotle’s system in which archē and ousia coincide.\textsuperscript{63} Still, as Solmsen charges, Aristotle at first claims nature to be its own source of motion, and then deduces that nothing really moves itself, and that something outside of nature is the explanatory source of all natural movement. It would seem that nature is and is not the reason (archē) for its activities. Aristotle himself seems aware of this difficulty and attempts to distinguish a passive from an active principle of motion. This would admittedly facilitate the progression of movement up to an unmoved mover. Living things present a greater problem since "self-motion" seems more apparent within their nature. But such movements as "growth, decay and breathing" are caused by external

\textsuperscript{60}Meta. XIII, 1086 b 4-6.

\textsuperscript{61}Physics VI, 234 b 10.

\textsuperscript{62}Meta. XII, 1071 b 20.

\textsuperscript{63}Meta. VII, 1040 b 19. Aristotle states that principles are not substances. In fact, principle is less substantial than unity and being which are not substances either. However, in Physics VIII and Meta. XII, the unmoved mover and the pure actuality are described as archai.
agents (e.g., food) which enter into the organisms. At any rate, living organisms do not "maintain continuous and unceasing self-movement," and this is enough to prove the need of an archê of continuous and eternal motion. These distinctions may not entirely free Aristotle from inherent inconsistencies, but perhaps they will allow a wider range of interpretation which may mollify the inconsistency. The distinctions are indicative of what was called above the bipolar tension between naturalism and Platonism. He will not allow that his naturalism be reduced to a Platonism of a Really Real world which takes away all meaning and significance from "nature." Nor will his Platonic tendencies be reduced to a naturalism which turns out to be a merely positivistic and quantitative approach. Aristotle is neither wholly Platonic nor wholly naturalistic. He is both and neither through his unique theory of principles. The archai are never wholly Platonic since they are never separate from natural things (the one exception links Aristotle with Platonic tendencies, the unmoved mover). The archai are not positivistic in the pre-Socratic sense because of the inherent qualitative forms and the extrinsic principles of efficiency and finality. They are not positivistic in the modern sense for the historical reason that refined observational techniques were not available for Aristotle to devise

64 Physics VIII, 259 b 15.

65 The pre-Socratic version of positivism might be the reduction of archai to matter.

66 We would distinguish here "being Platonic" from "having Platonic tendencies." Aristotle's over-all theory of principles prevents him from "being Platonic"; but we would agree with Jaeger that Aristotle's ambition of looking for some kind of unifying perfection is indicative of his "having Platonic tendencies."
explanatory principles in terms of quantitative analysis. Yet this tension of the bipolarity finds its own unique value in a metaphysics that is sufficiently committed to sensible nature to appeal to the more empirically minded thinker and transcendent enough for the more theoretical philosopher. Aristotle offers a metaphysics of analogous principles that replaces the Platonic myth. Without analogy to ground his mythical ideals, Plato's option is a bit puzzling. Is one to opt for a "world" that is not real, or a reality that is not a world? With Aristotle's mythless analogy, one would seem to have a better choice. Explanations (principles) are offered of a real changing world. Yet a total system is also offered in terms of more or less the same principles. The "more or less" rubric manifests the analogous character and would seem to render the option as not mutually exclusive.

The differences of his two realms have been stressed. Investigating the similarities of these realms will complete our investigation of Aristotle's analogous principles and help to define further the terms of Aristotle's metaphysical option.

Similarities between the Two Realms

Aristotle's description in the De Coelo of the sensible but imperishable realm would seem to effect an irresolvable dichotomy between "heaven" and "earth." Indeed, the "dual physics" of Aristotle has become a commonplace expression usually uttered as a point of contrast to the universal gravitation theory of Newton which "swept away" the dual realms.  

It is true, of course, that once Galileo had begun to view Aristotelian formal structure as quantitative rather than qualitative, the path was open for a "new science" based on the quantitative approach of mathematics.

There is, however, nothing of a "dual physics" in the mind of Aristotle; i.e., there is no double set of principles which explains each realm independent of the other. The common misconception that there are two different sets of physical principles arises from the misuse of the term 'physics,' whereby its modern connotation as an inductive, positive science is applied to Aristotle's "physics" which was intended, of course, as a philosophy of natural things.

To be sure, there are differences which mark off the two realms; and these differences have been pointed out. However, Aristotle would insist that different realms can still have common principles and, further, that such common principles afford a unifying view of what is real without denying the differences between what is real. The differences are too observable for Aristotle to deny; "things around the center" come into and pass out of being, whereas the heavens always are. The rectilinear movement of the perishables tends toward infinity, while the circular motion of the aetherial bodies is eternal. Yet, in spite of these "undeniable" observations, Aristotle hoped for a world system that would be as "universal" as the system Newton laid down centuries later. It has already been noted that in the Metaphysics he groups the perishable and imperishable ousiai under the common classification of sensible things that move, hence both types
have a common bond that makes them object of one discipline.\textsuperscript{68} This vision of a universal "science" is more clearly expressed by Aristotle in the \textit{De Generatione et Corruptione} when he writes that the principles of perishable things "are equal in number to and identical in kind with those of eternal things."\textsuperscript{69}

The fact that the two realms share the common attributes of being sensible and being in motion gives Aristotle hope for a "science" of common principles of being. He identifies these common principles as his famous four causes beginning with the material cause which revolves the whole discussion around an ontology of being and non-being.

**The Material Principle**

"Now cause in the sense of matter, for things which are of a nature to come-to-be, is 'the possibility of being and not-being.'\textsuperscript{70} The "material principle" of eternal things is the "impossibility of not-being,"\textsuperscript{71} or, in positive terms, the necessity of their being.

In this passage of the \textit{De Generatione et Corruptione}, Aristotle distinguishes 1) things that necessarily exist; 2) things that, of necessity, do not exist (impossibilities); and 3) things that exist but do not have to exist.

\textsuperscript{68}Meta. XII, 1069 b 1.

\textsuperscript{69}De Gen. 335 a 28.

\textsuperscript{70}De Gen. 335 a 33.

\textsuperscript{71}De Gen. 335 a 35.
The first distinction marks off the realm of being in all its eternal necessity; the second establishes non-being as a total negation of what is; the third bridges the gap between being and non-being and becomes the realm of becoming which was the cause of so much speculative consternation among the pre-Socratic and Platonic thinkers. Aristotle accepts his heritage of being, non-being and becoming and integrates all of these notions under his archai theory. An understanding of the basic categories of what there is can be found in the "matter" of the entities.

At first glance, it seems odd that Aristotle should list these metaphysical classifications under the material principle. Is he using "matter" in a general and analogous way to indicate that all realms have a general "subject matter"? Or is he indicating a more ontic meaning that would envision a common material principle which explains the being-structure of the heavens and the becoming-condition of earth? He could mean both, of course, and still use the term analogously.

Judging in the light of Aristotle's assumption of a real world rendered intelligible through principles, and in view of his general tendency to synthesize reality into a limited number of principles, we would conclude that the "material" principles of both realms have ontological significance. That is to say, Aristotle recognizes the respective reasons for being and becoming in the basic material structure of the entities (imperishable and perishable). This interpretation—which is consistent with Aristotle's realistic

72 There are, indeed, other equally important causes which will soon be listed.
commitment—reduces considerably the dichotomous character of his physical system. To be sure, the "matter" of the heavens is eternal and necessary and cannot not be, while the "matter" of earth is temporal and contingent and can be and not be. These metaphysical differences have practical consequences insofar as the heavens being "unearthly" possess no weight. Also, the "differences" of the "material" principle cut so deeply that in pondering the sphere of the universe "nothing made by man, nor anything visible to us on earth can be compared to it." 

In the face of such statements, why does Aristotle attempt to hold on to "principles of perishable things that are equal in number and identical in kind with those of eternal things"? Specifically, why would Aristotle claim that both realms have a material principle that explains their respective Being-Becoming status? It could be that the attempt to explain "observable" differences of the two realms in terms of an analogous principle strains consistency beyond endurance. On the other hand, if Aristotle's faith in the reality of physical existence and experience is to be taken seriously, then Aristotle simply might be saying that nothing in the way of physical experience here on earth can compare to the realm of ouranos. Yet it is sensible and is moving so that it must have some kind of material archē. The greatest inconsistency in Aristotle's texts seems in his identification of highest knowledge with "highest" things on the one hand,

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73De Coelo, 284 a 21.  
74De Coelo, 287 b 16.  
75De Gen. 335 a 30.
and yet his constant return to the certitude of what we experience here and now. Unlike Plato, Aristotle is quick to point out instances in which sensory experience can support his theory: "The evidence of sense perception supports our view."\(^{76}\)

His empiricism—as we noted in a previous chapter—is based on gross observation rather than controlled experimentation, yet Aristotle is empirical enough to assert his doubt about the eternal heavens even though some material principle must apply.

Rather than appear as an inconsistency, it might be taken as a theoretical hope on the part of Aristotle arising out of what was called a bipolar tension of Platonic rationalism and empirical naturalism. The same tendency might be seen in Newton's adamant "Hypotheses non fingo;"\(^{77}\) on the one hand, and his theoretical hypothesis on the nature of light found in the "Queries" of his Optics. The tension of theory and experience can apply as well in Newtonian terms. The universal theory of gravitation gave mathematical expression to the material archē of celestial bodies, and thereby gave new insights into their "nature and properties." Yet more certain knowledge of a weightless state or of motion in a different gravitational field waits upon the actual, individual experience. Even though the same gravitational principle applies throughout the universe, yet there are different experiences falling under that principle.

\(^{76}\)De Gen. 336 b 16. In this passage Aristotle is speaking of the sun as efficient cause of generation and corruption on earth. All of the physical treatises rest on empirical observation.

Aristotle, likewise, hopes to bring the whole study of nature under common principles. Since mathematics is still considered as somewhat of a divine science looking up toward the One rather than down toward the physical Many, Aristotle will not adopt the quantitative approach of mathematics. His qualitative principles face a severe test. How can the same qualitative principles apply to a realm (the imperishable heavens) which by all observation is qualitatively different? Only by reducing both realms to most general expressions of being and non-being can the same principles be applied. Aristotle's synthetic approach wants to have the study of nature include all bodies—the whole heaven (οὐρανός). In addition, there is the tendency to reduce all physical phenomena to common physical explanations. In the Meteorologica, which deals with an "in-between" realm that is close enough to earth and far enough from the heavenly spheres so that natural events happen with "less regularity" than the more ordered heavens, a common physical cause of three basic phenomena is cited. The "dry exhalation" (ἐνυφον) is said to be the material cause of wind (on the surface of the earth), earthquakes (beneath the surface of the earth), and thunder and lightning (above the surface of the earth).

78 This tendency to synthesize was cited above.
79 De Coelo, 298 a 30; 298 b 1-5. In these passages Aristotle concludes that the term "nature" refers to all bodies.
80 Meteor., 338 b 22.
81 Meteor., 370 a 22.
Also, Aristotle's whole discussion of generation and corruption is based on the transmutation of one basic element into another, which in turn rests on a "matter that is common to all" (τὸν κοινὸν).\footnote{De Gen., 332 a 19.}

In the De Coelo, Aristotle states in typical fashion that in one sense the four elements must have different matter since their properties are different.\footnote{De Coelo, 312 b 20.} Yet in another sense, matter is common to all since the bodies are generated out of each other.\footnote{De Coelo, 312 a 31.} His answer is that there is a common material principle realized in different material bodies.\footnote{Leo Elders maintains that Aristotle's use of matter in this section of De Coelo III, is different from the "matter" of the De Gen. and the Physics. He gives no reasons for this claim. Cf. Aristotle's Cosmology (The Netherlands: Van Gorcum and Co., 1965), p. 361.}

If Aristotle has difficulty reconciling "sameness and difference" in and among the perishables, how much more difficult must a universal understanding be?\footnote{Aristotle compounds the difficulty by failing to distinguish or attempting to distinguish "matter" as physical sensibilia from "matter" as something intelligible.} Yet he would maintain that the realms are the same in their very differences. Both involve a material principle. The perishable realm involves matter that "can be and not be"; the imperishable realm involves matter that "is" of necessity.
The Formal Principle

In spite of the "dual physics" which developed historically out of the writings and interpretations of Aristotle, we have seen that "heaven" and "earth," the circumference and center, are joined under the common name of "nature." Furthermore, a common material principle helps effect the merger whereby "nature is sensible and mobile." However, the material principle is analogously realized so that in addition to the similar natural traits mentioned above, there is also a natural difference. Expressed in ontological terms, the difference between "heaven" and "earth" is the difference between "must be" and "need not be."

In addition to the common material principle, there is a "second (principle) in the sense of formal principle." Aristotle's formal principle serves as a "mean" in several ways. First of all, in the realm of perishable entities, the formal principle bridges the gap between a materialism which would "explain" generation by the mere juxtaposition and accretion of material elements and a Platonism which bogs down in a theory of participation in pure forms. In either case, the view is "unnatural" as far as explaining coming-into-being is concerned. "For they exclude the essential nature and the form." Perhaps Aristotle's "naturalism" is best seen here where he identifies the natural development of things with their ousiai.

87 De Gen., 335 a 31.
88 De Gen., 335 a 8ff.
89 De Gen., 335 b 35.
What things are by their nature is the cause of generation. Empedocles, who had done well according to Aristotle to cite the four basic elements, nevertheless could not explain the natural mixture of those elements. He envisioned no formal principle. For Empedocles, growth could be effected only by accretion. What is more, only fire increases fire, and earth increases earth. For Aristotle, the mixture of elements needs no forces (love and strife) which lie outside of the natural elements. Rather, the mixture is the natural thing itself. It is "matter" plus an inherent determinant "which constitutes the nature of each thing"; and Empedocles, in effect, has "nothing about the nature of things" in his treatise. Formal principle, in the perishable world of things that come into and pass out of being, is a proper mixture of actuality and potency which destroys excesses and establishes a mean.

Aristotle's conception of "form" as principle, i.e., as rational structure, mediates an a-structural materialism, on the one hand, and a Platonism of Forms-as-entities, on the other. (Cf. Physics II, 194 a 13ff.) With "Form" established as a principle, Aristotle can now span a wider gap--the difference between things that are generated and things that are necessary. The perishable things are not "mere matter"; the imperishable things are not "pure forms." Both realms contain individual, physical

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90 De Gen., 333 a 35; 334 b 1-3.
91 De Gen., 333 b 17-19.
92 De Gen., 330 b 25ff. Aristotle maintains that freezing and boiling are excesses of the formal structure of what is cold and hot, respectively. Therefore, nothing can be generated from ice and fire.
realities which are rendered intelligible in terms of the matter-form archai. Aristotle would insist that formal predominance is in direct proportion to a being's imperishable state. That is why "fire alone--and to a greater extent than the rest (of the elements) is of the nature of 'form,' because it naturally tends to be borne toward the limit." It may be said, then, that the beings of the heavens are "more formal" than the beings of the earth; i.e., the heavenly bodies are more fully determined, more actual than potential. This is Aristotle's intention. There is less potentiality in the eternal entities which are not capable of qualitative or quantitative change, nor are they capable of generation or destruction. They are, however, potential for local motion. They are dynamic in the sense of ever moving; and in this sense, their circular motion defines their more perfect forms.

The difference between the two realms, therefore, does not seem to be as great as it might appear to be. Both realms partake of beings whose principles involve them in the natural order of things that are sensible and mobile. Both types of entities have material and formal characteristics. Both types of entities manifest actuality and potentiality. These are the principles that Aristotle searched for in looking for "principles of perishables" that are "identical in kind" with those of the eternal things. Aristotle wanted no "dual physics." He favored no double set of explanatory principles for each realm. Both realms were counted under the study of "Physics," i.e.,

93De Gen., 335 a 19-20.
a study of nature that was "metaphysical" as much as it was "physical."

When "Physics" assumes the quantitative, experimental approach of modern science, then Aristotle's sublunar "physics" appears wholly inadequate in its application to the celestial bodies.

All of this, however, ignores the basic problem within the Aristotelian doctrine itself. Aristotle wants the same principles to apply to both realms. The analogous character of his archai will allow the same intelligible principles to be applied in different instances. However, in preserving unity in and among differences through analogous principles, the differences would almost always be qualitative rather than quantitative. And when beings differ qualitatively, there would seem to be a difference in kind rather than in degree. Yet Aristotle hopes for principles that are "identical in kind." Aristotle asks in the Metaphysics, "Why is it that some things are perishable and others are not, assuming that they are derived from the same principles?" He rightly identifies this as one of the major problems facing a "lover of wisdom." How can the same kind of principles explain different kinds of beings? His analogous principles (especially formal principle) are an attempt to solve the problem, which extends to all modes of reality, including ethical values, political norms, poetic rules. His task is an immense one in which all aspects of reality are approached through a limited number of general principles.

94Meta. III, 1000 b 20.
The "scientific" endeavor became much more simple and effective when Galileo viewed formal principles as quantitative rather than qualitative. It became much more consistent since now the whole of physical reality could be viewed as differing merely by degrees—degrees of mass in spatial and temporal relations.

This latter approach, however, engendered another problem. What should be done with qualitative values? Aristotle's philosophical principles save the realm of values at the price of an effective "physics."

It may be argued that Aristotle's "values" are not worth the price of his sterile physics, and that his rational approach to ethics is as vain as his explanations of earthquakes and thunderbolts. To understand Aristotle's philosophical endeavor, however, one must first understand his unique brand of naturalism in its historical setting, and then venture to see if and how his vision may be of any value today. This would take us far afield of the task at hand. The suggestion offered here is at first negative: Aristotle's view of nature should not be compared pari passu with the task of modern physics. Aristotle's vision is quite different. His scope is broad, perhaps too broad; his approach is common sensical, perhaps too much so. But the questions he asks are legitimate questions. He asks why it is that stones tend to fall and trees grow and men think. He asks why hailstones occur in warm weather and why comets appear to have tails and why there is salt in the sea. He asks why the sun and moon seem to move in a circular motion while the stars appear fixed. His practical answers turned out to be more wrong than right. But his general approach to any
realm, or rather to the one realm of nature through principles, has willed something to posterity that constantly recurs—the notion of nature as an intelligible dynamism. This view of nature is especially true when the principles are the inherent matter-form or act-potency principles. Aristotle's nature is material enough not to be absolute and formal enough not to be sheer necessity. In positive terms, nature is material enough to be dynamic and formal enough to be understood. Whether perishable or imperishable in the final analysis, it is one realm—the natural realm. Expressed in terms of material principle, it is nature as moving; under the rubric of formal principle, it is nature as expressible. Once the inherited distinctions of perishable-imperishable are made within nature, Aristotle can further distinguish his principles. As was mentioned above, the material principle becomes the "must be" characteristic of the eternal beings, and the "need not be" characteristic of ephemeral things. The formal principle of imperishables takes the expression "everything is what it is and will remain so." The formal principle of the perishables is uttered as "everything is what it is and can become other."

95Aristotle begins the Third Book of the *De Coelo* with an analysis of the word "natural":

"Now the word 'natural' is applied on the one hand to substances, and on the other to functions and attributes of substances. By substances I refer to the simple bodies, fire and earth and the others, and things composed of them, e.g., the heaven as a whole and its parts, as well as animals and plants and their parts; attributes and functions include the movements of each of these substances and all movements of the others for which each is responsible by virtue of its proper power, and also their alterations and mutual transmutations. It is obvious therefore that the study of nature is concerned for the most part with bodies, seeing that all natural substances either are bodies or are dependent on bodies and magnitudes." (298 a 27; 298 b 4.)
The Final Principle

The third common principle that Aristotle cites in his attempt to effect a common bond of being is the "final cause" or the "end-in-view." In a certain sense, the finality of a being is identified with its formality. The formal expression of "what something is," involves a final understanding of "what something is for." As Aristotle phrases it, "Cause in the sense of their 'end-in-view' is their shape (\( \mu \omicron \omicron \phi \nu \)) and form (\( \epsilon \delta \sigma \zeta \))." In the Physics, he is even more explicit concerning the coincidence of form and end. "For the essential nature of a thing and the purpose for which it is produced are often identical--so that the final cause coincides with the formal." And again: "Also since the term 'nature' is applied both to material and to formal principles, and since it is the latter that constitutes the goal, and all else is for the sake of that goal, it follows that the form is the final cause." This identifying of the formal with the final does not exclude unachieved ends in Aristotle's system of nature. On the contrary, there are "failures of purpose in Nature." But failures of purpose occur not because the end-striven-for is outside of natural happenings, but rather because of a "miscarriage of some archē" within nature itself. The 'end' or realization of nature is contained within the formal expression of nature.

96 De Gen., 335 b 7.
97 Physics II, 198 a 26-27.
98 Physics II, 199 a 32-33.
99 Physics II, 199 b 4.
itself. This is what "nature" primarily means: beings that are intrinsically goal directed. Things which exist by nature "have within themselves principles of motion."¹⁰⁰ For Aristotle, nature is self-explanatory, i.e., the reasons for understanding that which is natural are found in natural things themselves. There is nothing artificial about nature. All of this seems to beg the question, and perhaps it does. Aristotle never maintained that "nature" could be "proven." He explicitly denies that "the natural" can be proven.¹⁰¹ Either one sees it or he does not. Also it cannot be proven that the goals of natural things are contained in nature itself (for this is part of the meaning of nature). It is an Aristotelian assumption couched in the language of his principles "that nature is a principle, then, and a goal-directed one, is beyond dispute."¹⁰² Teleology, of course, permeates the thinking of Aristotle. Even his treatment of chance occurrences is set in a framework of finality.¹⁰³ The specific task at hand is to ascertain how the principle of finality¹⁰⁴ unites the beings above and below

¹⁰⁰Physics II, 192 b 14.
¹⁰¹Physics II, 193 a 2-9.
¹⁰²Physics II, 199 b 32.
¹⁰³Physics II, especially 198 a 6-13.

¹⁰⁴The English word 'finality' or 'finite' does little justice to the Greek τέλος in that the former terms connote a cessation or termination of a deed or state of being. In this sense it would seem quite paradoxical that τέλος should be an ἄρχη. The meaning of the term in this discussion shall connote a "completion" or "fulfillment" or "perfection" that beings have or are striving for, depending upon their state of being. To say with Aristotle, therefore, that something has "reached its end" is not to utter pejorative words, but rather it is to indicate an αρχη of realization.
the sphere of the moon in some kind of a natural order. Aristotle's lengthiest and most complete analysis of the teleological principle of nature is found in the second book of the *Physics*, Chapters 7 to 9. The discussion is a rather general one in which it is seen how the basic principles are to be applied in a study of reality and what division of sciences ensues. The claim is made by Aristotle that wherever things are found that cause motion or are themselves in motion, the "domain of physics" prevails and the four general principles are to be applied.  

He then goes on to classify "three fields of inquiry" basing his distinctions on whether or not the objects of inquiry are in motion. The first field of study deals with "things motionless," the second with "things that, though in motion, are imperishable" and the third with "things perishable." However, since motion and non-motion provide the basis for his distinctions, the division falls into two main categories rather than three: 1) study of immobile being; and 2) the study of mobile being. The second category is then subdivided according to whether or not what is in motion is perishable or imperishable.

Aristotle did not name at first the two general branches of study in the *Physics*, but he later (*Metaphysics* VI) identified them as theology and physics. In a passage of the *Metaphysics*, he adds a third speculative science, mathematics, which finds a middle position between theology and

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105 *Physics* II, 198 a 27–29.

106 *Physics* II, 198 a 30–32.
the study of nature.\textsuperscript{107} In his treatment on nature, then, both the perishable and imperishable entities are to be studied; and, specifically, nature is better understood in terms of nature's purpose.

In approaching the problem of purpose in nature, Aristotle examines "finality" and "necessity."

"We must now consider why nature involves a "for the sake of which" cause, and further we must consider what is meant by necessity."\textsuperscript{108}

First of all, Aristotle rejects the notion that natural movements and changes are the result of blind, random necessities. Such a mechanical view can never explain why regular patterns of action develop in nature. The orderly sequences of nature could hardly be due to chance coincidences.\textsuperscript{109} Those who held to such a view, according to Aristotle, recognized only the material factors of nature. And when only "matter" is considered, it is right to expect things to happen "out of necessity" (ἐξ ἀνάγκης). However, nature involves more than just nature's materials. Nature is self-preservation. Just as in the art of house building we would not expect the materials to all of a sudden put themselves into place, so also in the realm of things natural one does not expect blind, random motion. There is an inherent ordering principle in nature. Just as the house is built for the purpose of keeping and preserving certain goods, so too nature acts for its good—that of sustaining itself.\textsuperscript{110} Aristotle does not deny necessity as part

\textsuperscript{107}\textit{Meta.} VI, 1026 a 19ff.

\textsuperscript{108}\textit{Physics} II, 198 b 10-11.

\textsuperscript{109}\textit{Physics} II, 198 b 17ff; also cf. \textit{De Partibus Animalium}, 642 a 1.

\textsuperscript{110}\textit{Physics} II, 200 a 6-9.
of the natural make-up. The necessity, however, is a conditional necessity (εὐθείας) which the being's purpose demands of its "matter." Material structure alone cannot explain how certain ends are regularly attained; but if ends are attained, then a certain material structure is required.

It (purpose) cannot be accomplished without materials having the required nature. . . . The necessity, then, is conditional, or hypothetical. The purpose, mentally conceived, demands the material as necessary for its accomplishment; but the nature of the material, as already existing, does not necessarily lead to the accomplishment of the purpose. \(^{111}\)

Aristotle draws from technical skills to exemplify his reasoning. Thus, if a saw (form) is to be used for cutting (purpose), there must be iron present (matter) out of which the saw is made. The fact that iron exists is no guarantee that a saw-for-cutting exists. The necessity does not run in that direction. However, the saw's purpose does necessitate the existence of a certain material. Since "art imitates nature," it is not surprising that Aristotle sees the same kind of "hypothetical necessity" in nature, both perishable and imperishable realms. In the latter realm, the heavenly natures never fail. There is complete coincidence of form and end. But even here, the self-realization that is manifested in circular motion dictates a "necessity of being" that is rooted in a strange and mysterious, but material, principle. Such is the nature of the heavens whose "best possible arrangement" is explained by self-contained, intelligible principles so that no appeal to an Atlas nor any mythical figure is necessary. \(^{112}\)

\(^{111}\) Physics II, 200 a 10-15.

\(^{112}\) De Coelo, 284 a 5-20.
also is the nature of things generated: that an intelligent ordering within
nature itself dictates certain structure which is a sine qua non of all
purpose and finality. The ultimate model that guarantees the application
of finality to both realms is that of circular motion applied with ontic
meaning.\textsuperscript{113} The process of generation will never cease since nature
always intends the better, and "being" is better than "non-being."\textsuperscript{114}
This eternal generation, of course, reflects the eternal order of the spheres;
and the "cause of this continuous process, as has been frequently re-
marked is cyclical motion, the only motion which is continuous."\textsuperscript{115}

The tendency of sublunar beings toward rectilinear motion (which
has no end but tends toward infinity and/or a void) is obviated by the re-
current transmutation of the four basic elements which recurrence gives
cyclical characteristics to the process of generation.\textsuperscript{116}

\textsuperscript{113}In the Physics, Aristotle uses the terms "perishable" (ϕαρτός) and
"imperishable" (ἄϕαρτός) to indicate "movement on a finite
straight line." He denies that rectilinear motion ad infinitum is possible.
Rectilinear motion that does aim at an end either 1) "does not return upon
itself and having no intrinsic completeness must be broken off" (ϕαρτός
or 2) "is not capable of being broken off" (ἄϕαρτός). Physics
VIII, 265 a 21-28.

Aristotle recognizes that even in the sublunar realm of recti-
linear motion there is an "imperishable" circularity of the generation of
species along with the "perishable" nature of individuals. Cf. De Gen.,
338 b 14-16.

\textsuperscript{114}De Gen., 336 b 25-30.

\textsuperscript{115}De Gen., 337 a 1-2.

\textsuperscript{116}De Gen., 337 a 4-6.
Yet if the tension in Aristotle's philosophy seems to be tending toward the pole of his Platonic inheritance, he quickly reasserts his realistic naturalism and maintains that, while the ordered cycle of imperishables is numerically the same, the cycle of generation is specifically the same. As expected, the necessity of things generated is less imposing than that of things eternal. Individuals, as such, have no guarantee of existing. "There is no necessity, because your father came to be, that you should come to be; but if you are to come-to-be, he must have done so." While recognizing order and purpose in both realms, Aristotle's teleological principle applies differently. In both realms, nature is expressed as end-directed. In the perishable realm, finality manifests a conditioned necessity of an ephemeral nature. In the imperishable realm, finality manifests an absolute necessity of a permanent nature.

The Efficient Cause (Moving Principle)

One can do well in a study of nature by analyzing the "stuff" out of which things are made, the "structure" or "form" that the stuff assumes, and the "reason why" the stuff is so constructed. But nature is basically

117 De Gen., 338 b 15.

118 De Gen., 338 b 10-11.

119 In the Meteorologica, Aristotle states that "the final cause is least obvious where matter predominates" (390 a 3). The heavens being more "formal" would naturally exhibit more "finality."
movement;\textsuperscript{120} so that if one is to understand nature, one must understand movement.\textsuperscript{121} The precise principle of movement in the Aristotelian theory of archai adds the dynamic character to nature, whereby "there must be something to initiate the process of the change or its cessation when the process is completed."\textsuperscript{122} It is true that matter is potential for many different forms, but matter is to form as potentiality is to actuality. Change, in fact, is precisely the movement from potentiality to actuality. This movement (since actuality is prior to potentiality) demands an agent outside of change itself. Aristotle's well-known principle of efficiency—"if a thing is in motion it is of necessity being kept in motion by something"\textsuperscript{123}—relates to his theory of finality. The order of nature which, as was seen, demands some necessary material structure, likewise demands some "orderer." Since the goal-directed aim of nature will not admit of a blindly developing potentiality, the reason why such a potentiality tends toward a goal cannot be found in the potentiality itself. Something cannot actualize its own potentialities. An agent is needed to effect the change.

The general notions of efficient cause as principle of motion which Aristotle outlines in the \textit{Physics} and the \textit{Metaphysics} are applied to the whole of nature and also to specific instances of natural events. First of

\begin{itemize}
\item \textsuperscript{120} \textit{Physics} II, 192 b 14.
\item \textsuperscript{121} \textit{Physics} III, 200 b 12-13.
\item \textsuperscript{122} \textit{Physics} II, 194 b 30; also \textit{Meta.}, 1013 a 30.
\item \textsuperscript{123} \textit{Physics} VII, 241 b 24-25; also cf. VIII, 256 a 5; III, 201 a 24; also \textit{Meta.} XII, 1073 a 26-27.
\end{itemize}
all, the general principle of a moving agent is to apply to the whole of nature, since "movement is imperishable." Movement is an eternal characteristic of nature for "if we suppose movement to have had an origin we shall have to suppose that there was a change anterior to the first change, so also if we suppose it to cease, we shall have to admit a change posterior to the last change." The movement of nature will not admit of beginning or end in a total sense of The Infinite. Whether the natural movement is the cyclic revolutions of the heavenly bodies or the regeneration of the specific sublunar bodies, movement is inseparable from nature. And to say that movement is inseparable from nature is to say that movers are inseparable from nature.

In Aristotle's specific and more practical investigation of nature and the natural, there are any number of "moving principles." The smith who makes the saw from the iron, the builder of houses, the parents of children, all are agents who are effecting changes aimed at a definite end in mind. In a more theoretical vein, Aristotle cites two agencies that explain motion in the whole of nature. Agents which both distinguish and unite the two realms of nature are: 1) the sun as the moving principle of all generation and corruption beneath the sphere of the moon; and 2) the

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124 Physics VIII, 251 b 29.
125 Physics VIII, 251 b 30-33.
126 De Coelo, 268 a 1-6.
movement of the outermost sphere (πρῶτος οὐρανός) as the moving principle of the heavenly bodies.

Concerning the approach and withdrawal of the sun as efficient cause, Aristotle supports "the evidence of sense perception" with some metaphysical theory. He appeals to the realm of things-that-are (in this case the sun) to explain why things come-to-be, since "movement is prior to coming-to-be." He reasons that that-which-is ought to be the proper explanation of that-which-comes-to-be. Furthermore, that-which-is is necessarily in motion. It seems quite natural to Aristotle that what already is and is moving should be the cause of coming-into-being and motion. The senses seem to confirm that the heat of the sun, as it approaches, causes things to grow and reproduce, while the approach and withdrawal of the sun's motion provides an analogous role of contrariety, which is an essential characteristic of motion of perishable entities. Simple, continuous, circular motion is not adequate, according to Aristotle, to explain the contrary motion of coming-into-being and passing-out-of-being. "Contraries are the cause of contraries. It is not, therefore, the primary motion which is the cause of generation and destruction." 

Yet Aristotle is not satisfied. Having already bridged the gap between things-that-are and things-that-are-becoming, he unites the realms even

127 De Gen., 336 a 24.
129 De Gen., 336 a 31-32.
further. If it is true that the motion of perishable beings runs a course of contraries (coming into and passing out of being), it is also true that there is continuity in the very contrariety. That is, the sequence of passing through contrary phases is continuous.\textsuperscript{130} He must explain not only the "double movement" (δύο κίνησις) but the "continuous" (συνέχεις) movement as well. It might be asked why Aristotle does not cite the continuous movement of the sun as it approaches and withdraws; thus both attributes can be found in a single cause. Aristotle does not do this for the apparent reason of not wanting to exclude the planets and stars from the general order of nature. Aristotle consistently (though erroneously) identifies the outermost sphere (the movement of the whole) as the cause of continuity in things that come-to-be.

There is, then, an interaction of efficient causes or moving principles that explains why things come-to-be. In order for there to be generation and corruption, there must be continuity and double movement. The "first heaven" provides the continuity; the sun provides the double movement.\textsuperscript{131} Aristotle's archai span both realms of nature. Motion on earth can take place "between opposites" and yet be continuous. For example, the approach of the sun causes evaporation of water and the subsequent cycle of rainfall.\textsuperscript{132}

\textsuperscript{130}An example of this was already seen in cyclic generation of species in the animal and vegetable kingdoms.
\textsuperscript{131}\textit{De Gen.}, 336 b 1 ff.
\textsuperscript{132}\textit{Meteor.}, 346 b 22.
All of this speculation on the part of Aristotle takes nothing away from the causal efficacy of blacksmiths, parents and house builders. His theory of principles is practical enough and flexible enough to admit of a host of principles. Indeed, sometimes it seems that anything can be an archē. In the perishable realm, "principle" can be anything from a father to the "starting point" of a journey. In the imperishable realm, archai are sometimes multiplied ad absurdum (55 movers).

Yet Aristotle manages to keep a tight rein on his archai and prevents a madcap dash into a meaningless infinity. The general classifications effect this; and since "principles" are explanations of what-is-real, a somewhat synthetic view of "what-there-is" is also effected.

According to modern standards, of course, Aristotle's "synthesis" may be wholly impractical and without meaning. Even to interpret his theory of the sun-as-cause-of-generation as a visionary forerunner of the sun-as-source-of-all-energy is not to find originality or exceptional genius in Aristotle's philosophy. What value there is in his classification of principles--especially in this case of efficient causality--may be seen 1) in his systematic approach to practical cause-effect sequences; 2) in the fact that the realm of nature for Aristotle extends to all observable data; 3) in that the unmoved mover plays no necessary role in the present explanations of nature.
The Transcendent and The Transcendental

It was seen that Aristotle's general principles are analogously applied to the natural realm of perishable and imperishable entities. Insofar as the principles are general enough and analogous enough to cut across all classifications of beings, they (principles) can be called "transcendental." That is, they are transcendental in the negative sense of being "unclassifiable," and not as the exclusive principles of any particular type of being. In a more positive sense, principles as transcendent extend to all types of realities and serve as intelligible explanations of what-there-is.

For the most part, Aristotle is preoccupied with attempting to explain (seeking the principle of) the two kinds of substances coming under the general heading of "the natural." "We have seen that there are three kinds of substance, two of which are natural and one immutable..."¹³³ This unique brand of Aristotelian "naturalism" breaks down into two realms of imperishable and perishable ousiai studied by astronomy and natural philosophy. Both studies, of course, employ the same transcendental and analogous principles. This metaphysical naturalism of Aristotle was located at one end of a "bipolar tension" which manifests the constant struggle in Aristotle to rescue his Platonic heritage from lapsing into either the unnatural or supernatural. It is not to be inferred that Aristotle

¹³³Meta. XII, 1071 b 3-4.
foresakes his Platonic heritage. On the contrary, he quite willingly embraces it and remolds it into his own systematic approach.

"We must now discuss the last named substance (immutable) and show that there must be some substance which is eternal and immutable."\textsuperscript{134} The enigmas surrounding the Pure Act of the \textit{Metaphysics} and the Prime Mover of the \textit{Physics} are well known in philosophical circles. Perhaps the greatest puzzle is Aristotle's inconsistency in positing nature as an inherent principle of motion and, finally, in looking beyond nature for the ultimate explanation of natural movement.

In both his approaches, whether it is the approach through eternal motion to the Unmoved Mover of the \textit{Physics} or the more axiological approach to the self-thinking Good of the \textit{Metaphysics}, Aristotle arrives at a Transcendent Being—a Being that stands outside of and is independent of the natural realm, and yet whose existence is necessary for the natural realm. Our main concern here is not the consistency or inconsistency of Aristotle's Transcendent Being. Nor is the concern the necessity or non-necessity of such a being for the natural realm which Aristotle has explained. The question that should occupy us here is how does Aristotle's theory of principles fit the notion of an Unmoved Mover? Is, for example, the Prime Mover a principle? If it is a principle, does it apply analogously throughout reality? Aristotle distinctly calls the immutable \textit{ousia} an \textit{archê}. In the \textit{Physics}, it is "the principle of everlasting motion" (\textit{ἀρχὴ ζωής}).

\textsuperscript{134}Meta. XII, 1071 b 4-5.
In the *Metaphysics*, it is the "principle whose essence is actuality" (δρχὴ ἡς οὐσία ἐνέργεια). In attempting to solve the aporiai presented early in the *Metaphysics*, Aristotle was careful to preserve the "referential" character of archai. "Principle" is not an ousia. It is not a thing-in-itself. "Principle" is the reason or understanding of something. It is the principles of substances that are to be investigated: whether there is a finite or infinite number of principles; whether the principles are of a perishable or imperishable nature. Aristotle remained faithful to this notion of "principle" as he explored the natural realms and analyzed actual and potential aspects of beings, distinguished formal characteristics from privations, and so on. But even then, early in the *Metaphysics*, Aristotle's theory of principles remained open to a Transcendent Principle. While it is true that principle is not a substance, yet "substance is a kind of principle and cause." All the while Aristotle viewed the transcendental first principles of changing nature, his gaze was also fixed on a Transcendent First Principle. The poles of Aristotelian tension come to grips in the form of the transcendental principles and the Transcendent Principle. The former embodies Aristotle's philosophy of nature (Aristotelian Naturalism) which, in a sense, is more "metaphysical" than "physical" since its transcendental

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135 *Physics* VIII, 266 a.
136 *Meta.* XII, 1071 b 20.
principles are non-empirical explanations of natural experiences. The latter embodies the rationalistic tendency to explain everything in terms of The One. "The rule of many is not good, one ruler let there be."\textsuperscript{139} The Transcendent Principle of principles stands apart from the sensible realms of perishable and imperishable nature. While causing motion, it does not move, it has neither parts nor dimensions. Indeed, it has no magnitude.\textsuperscript{140} It is the Pure Act of Thought thinking itself.\textsuperscript{141}

Aristotle even gallantly attempts to apply his Transcendent Principle throughout the transcendental realm of his principles. Nous is Perfect Form ("the principle whose essence is actuality"), the first efficient principle of change\textsuperscript{142} and, since form and end coincide, the epitome of Goodness and Finality itself. "It (Prime Mover) is good and is in this sense a first principle."\textsuperscript{143} Only matter and privation are dropped from the characteristics of The One.

Since the Perfect Form is a complete identity with its end or purpose, it represents an Absolute Goal and ought to be studied by natural philosophers since nature is essentially goal directed.\textsuperscript{144} Thus, Aristotle attempts to justify his rationalistic Transcendent in terms of his transcendental naturalism.

\textsuperscript{139}Meta. XII, 1076 a 5. Aristotle is quoting from Homer's Iliad.
\textsuperscript{140}Physics VIII, 267 b 25-27. Cf. also Meta. XII, 1073 a 4.
\textsuperscript{141}Meta. XII, 1074 b 35.
\textsuperscript{142}Physics VIII, 267 a 25. Also Meta. XII, 1072 a 22.
\textsuperscript{143}Meta. XII, 1072 b 11.
\textsuperscript{144}Physics II, 198 b 4.
In the end, Aristotle's theory of principles does not pay sufficient attention to the epistemological problems incurred when one tries to understand something. Objectively, it is the perishable realm of earthly activities that is his greatest concern. The puzzle and wonder of things that come into being and pass out of being seem to preoccupy most of his thoughts. How is one to understand such common events as birth, growth and development, reproductive continuity and death? There is, of course, the wonder of the heavens also. But the heavens are there—always there. Their more regular patterns of cyclic motion can perhaps yield principles that might explain the less regular patterns of the things of earth. This might suggest that Aristotle deduces the eternal principles of the heavens and applies them to the "things below the sphere of the moon," but it need not suggest this. What it might suggest is the "eternal" character of principles no matter what was being explained. Aristotle is too preoccupied with the earth to explain it away as a fleeting image of eternity. What he wanted were explanations (principles) of the real earth-beings, and he wanted the explanations to be durable. He does not begin with the "heavenly" bodies and deduce a principle of potency that applied to earthly bodies. He does not seem to say that since the heavens neither increase nor decrease in size and are neither generated nor corrupted, then the things of earth must have a potency principle because they do increase and decrease in size and are generated and corrupted. Rather it seems that he is reluctant to discuss the heavenly realm and the prime moving nous until he has first understood the puzzling non-fulfilled nature of the
physikoi. Once the principle of potentiality as a halfway house between what is and what is not is satisfactorily developed for Aristotle, then and only then can he infer that the heavenly entities have no potency (except for local change) and that nous is Pure Act.

First and foremost, there must be a real world of perishables. The Platonic myth in deducing many from The One never explains "the many" to Aristotle's satisfaction. There was too much of the Parmenidean reduction to unity in Platonic thinking to convince the more realistic Aristotle. Pluralistic thinkers are commended by Aristotle in that change was admitted by them and to a degree explained, but their techniques of "combining" and "separating" were poorly done so that the explanations could never be distinguished from what was being explained. "Their principles were wrong to begin with." Explanations must in some way be distinguishable from the quantitative bodies that they explain. Hence, principles are qualitatively rather than quantitatively conceived; and the salient quality seems to be analogy. It was for this reason that Aristotle had to have two natural realms.

In order to save the durability of principles and explain the perishable realms, principles could only apply to other realms in an analogous way. But at all costs, this realm must be saved, recognized and explained. It is true that the conception of two different systems as qualitatively distinct hindered the development of the "new sciences" in which the universe is seen and measured as a quantitative whole. But at least
Aristotle established the events of the perishables as real. And, perhaps, since Aristotle wanted to do too much—i.e., explain the whole of human experiences: Ethics, Poetry, Politics, etc.—he quite plausibly avoided the quantitative approach to reality. We may, perhaps, be witnessing the reverse problem today. In approaching reality in terms of numerical quantities in the positive sciences, one finds it increasingly difficult to understand and perhaps justify the more qualitative values such as the moral and aesthetical. Like most philosophical systems, Aristotle's scheme was grandiose. Through the archai, everything was given some sort of understanding. To effect this scheme of things, the principles must be durable and analogous—durable if the explanations are to have meaning; analogous if the principles can apply in some way to the entire structure. Just what role the human understanding played in the "fixing" of these "durable" principles never seemed to occur to Aristotle. The necessity of the principles for him is undoubtedly rooted in the things themselves, yet he begins his philosophy with things that are not necessary. Even so, if there seems to be no necessity involved in individual things, there may be something necessary about the classes of things to which those individuals belong. Individual men may come into and pass out of being; but as a definable class of objects, there is something more or less permanent about men. Individuals as such are indefinable because all talk about individuals involves the general, necessary classifications. This tension between the general conceptualizing, on the one hand, and the particular, individual on the other,
is rarely absent in the writings of the philosophers. Aristotle, although perhaps not explicitly aware of the problem, manifests this tension more than any of those who preceded him. The tension increases when the poles of "explanations" and "what is explained" converge. Aristotle's theory of "principles" effects such a convergence. And because Aristotle chooses to begin with "the many" rather than with The One, i.e., since he looks for necessary principles in the perishable, individual things themselves, he can refer the principles of necessity to what is qualitatively different only by analogy. Aristotle does not need the heavenly bodies nor the prime mover to explain the perishable realm. It happens that the same principles apply (analogously) in a different way so that the hypothesis of a perfect Good fits into the whole scheme. Therefore, the proximate goals of perishable beings may reflect the ultimate purpose of nous, but nothing prevents nous from being a speculative hypothesis in his system--once he begins with the perishables.
Aristotle did not err in the fact that his whole philosophical endeavor was aimed at formulating general, meaningful principles that might explain things. Nor did he err in assuming that what was real was intelligible. His error--which led to a dual system--lies in his assumption that the heavenly bodies were qualitatively distinct from earthly bodies and therefore were knowable in a different way. This does not mean that everything on earth was given the same explanation--not at all. Analogous principles permeated qualitatively different areas here on
earth, e.g., politics, rhetoric, ethics, mathematics. However, he assumed that the circular motion of the celestial bodies was so different that the bodies themselves differed radically. They had to be eternal.
IV. THE ROLE OF PRINCIPLES IN DEMONSTRATION

THE REALM OF REASON

It was seen that Aristotle's vacillation between a rationalistic
tendency to explain all of reality in terms of an all-pervading One and
an empirical preoccupation with a pluralistic reality led him to postulate
a dichotomous realm of nature that was nevertheless somehow bound
together by analogously applied principles.

In analyzing the role that Aristotle assigns to the archai in
demonstration (the realm of reason), we shall attempt to point out the
prevalence of the same tension existing in his view of scientific meth-
odology. The tension at one pole manifests itself in the a priori
character of Aristotle's axioms, which are the self-evident objects of
intellectual joy and contemplation. At this pole, the first principles of
demonstration have a greater intrinsic value (cognitional value) than the
very conclusions which are deduced from such principles. These prin-
ciples are "prior" and "more knowable" in their own right\(^1\) and embody
the discipline of *theoria*, which far exceeds *technē* in excellence.

At the other pole, Aristotle's principles of demonstration manifest
a more empirical search after facts--facts that are acquired through

\(^1\)Post. Ana., 71 b 20-25.
experience. Such a search begins with things that are "prior and more knowable to us,"\(^2\) i.e., the world of sensory experience. In this view, a welter of facts necessitates that there be different sciences with different principles. There is no one master plan which explains the whole of reality. There may indeed be a general plan of demonstrating facts and the reason for those facts, and there may also be "common principles" of demonstration that in some way unite the sciences. At least all the sciences—if they are sciences—employ demonstration, but for Aristotle there are always particular principles that guarantee a certain autonomy to the individual branches of learning and thus impart a more flexible and pliable character to the role of archai.

There is no intention here of justifying Aristotle's demonstrative science in the light of modern methodology and the results produced by the modern method.\(^3\) Certainly it remains true that Aristotle generally subscribed to the notion of science (epistēmē), willed to him by Plato, as the highest kind of universal knowledge which is complete in itself and that theoria consisted in the contemplation of self-evident principles.

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\(^3\)It is interesting to note that at the 1965 Hayden Colloquium on Scientific Method and Concept Ernest Nagel, in listing the "four types of causal explanations in science," lists the first as the "deductive form." Such causal method, "recognized since Aristotle," has as its aim "not simply to discover facts but to show that the discoveries are reasoned facts by exhibiting them as necessary consequences of explanatory premises." Given at the Massachusetts Institute of Technology, published in Cause and Effect, ed. D. Lerner (New York Free Press, 1965), p. 14.
"Theory," in this sense, is contrasted with "practice" in that the former involves the almost ecstatic contemplation of knowledge for its own sake, whereas the latter involves the skillful application of principles in doing or making something. The relationship between theory and practice in this Platonic-Aristotelian version is a hierarchical one in which the higher (theory) contains the "what" and the "why" of the lower (practice). The "practitioner" or "technician," on the other hand, may know how to do or make something but does not necessarily know what the reasons are.

Today, in scientific methodology, the term "theory" usually denotes a certain hypothesis that awaits some factual verification. In such a case, "theory" and "fact" are mutually exclusive: if a theory admits of practical verification, it ceases to be a theory and becomes a fact. There is still, perhaps, much of the Greek distinctions still prevalent today in the division of sciences as pure (theoretical) and applied; but, by and large, the men of the well-known Copernican revolution, through the application of mathematics, controlled experimentation, etc., have considerably changed the method and meaning of "science." The purpose here is simply to trace the role of principles in Aristotle's concept of demonstrative science and attempt to show how such principles are instrumental in effecting the bipolar tension, which was mentioned above, and which, it is claimed, permeates Aristotle's philosophy. If the rational-empirical tendency likewise appears in science today (even though in different forms), so much the better for Aristotle.
Perhaps the terms that best describe the polarity in Aristotle's realm of demonstrative reason are "axiomatic" and "postulational." The former term describes "demonstration" in the strict sense (ἀπόδειξις ἀπλῶς) and employs principles in a rationalistic manner. The latter term describes "demonstration" in a loose sense (ἀπόδειξις κατὰ συμβέβηκος) and employs principles in a more empirical and probabilistic sense.

**PRINCIPLES AS AXIOMS – AXIOMATIC DEMONSTRATION**

Demonstration, in the strict sense, is outlined with considerable clarity in the *Posterior Analytics*. Demonstrative knowledge is that syllogistic structure which produces "scientific knowledge," viz., knowledge of the fact and the reasoned fact. 4 Aristotle never seems to question seriously whether or not the truths of certain facts can be attained. He seems to assume that this is so and proceeds to explain why this is so.

Now if knowledge is such as we have assumed, demonstrative knowledge must proceed from premises which are true, primary, immediate, better known than, prior to, and causative of the conclusion. On these conditions only will the first principles be properly applicable to the fact which is to be proved. 5

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5 *Post. Ana.*, 71 b 20-23.
These characteristics of the premises or first principles, which are necessary if demonstration is to be possible, are clearly rationalistic and set the theme for the deductive form of reasoning which strict demonstration embodies. This form of reasoning advances from a universal understanding to some particular attribute predicated in the conclusion because of a necessary connection of terms. The universal starting points (archai) are thus "prior" and "more knowable" in themselves, i.e., "in nature" and not prior and more knowable to human sense perception. This "removal" of universality from human sense experience gives an autonomous kind of "dignity" to the first principles whereby they are more valuable in themselves than the conclusions which are derived from them. This inherent dignity and value of the first principles basically stems from their inherent truth and causative role in demonstrating other truths.

Aristotle assumes the truth of the archai of demonstration as part of his over-all aversion for the infinite. Just as any series ad infinitum was avoided in the realms of nature, likewise an infinite series is

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6 Aristotle identifies "premise" and "first principle"---"for by 'premise' (πράτασις) and 'first principle' (δράχή) I mean the same thing." Post. Ana., 72 a 7.

7 Post. Ana., 71 b 34-72; a 6.


9 Post. Ana., 72 a 26 ff.
avoided in the realm of reason. In the former realms, it usually is an
infinite series of causes-as-movers which is denied; in the latter realm,
it is an infinite series of causes-as-"provers" that is denied. In order
to prove a fact as true, one must proceed from a prior truth. If that latter
truth is a demonstrated truth, it, too, must depend on a more prior truth;
but to regress ad infinitum is to prove nothing. The ultimate, primary
principles are indemonstrably true. Aristotle acknowledges that other
thinkers have recognized the necessity of first principles of demonstration.
But while some have contended that because the archai cannot be demon-
strated, there can be no knowledge, others have maintained that
knowledge is possible because even the archai can be demonstrated.
The former group, according to Aristotle, rightly rejects the infinite
regress but wrongly despairs of any kind of knowledge by proof; the lat-
ter rightly assumes that demonstrative knowledge is possible, but wrongly
bases it on circular or reciprocal principles. Aristotle's own view, of
course, is 1) that demonstrative knowledge is possible; and 2) that the
first principles of demonstration cannot be demonstrated.10

Whatever is the basis of all demonstrative truths is, then, true
in its own right. All the other characteristics that Aristotle enumerates
can be reduced to the self-contained truth of the archai. The archai that
carry with them the greatest truth value and priority, insofar as they must
be known if anything is to be demonstrated, are the axioms.11

10 Post. Ana., 72 b 5940; 73 a 1-40. Also Meta. IV, 1006 a 8-12.
11 Post. Ana., 72 a 17.
Aristotle actually makes very few direct references to "axioms" in the *Posterior Analytics*. (The term ἀξίωμα is used only three times.) He seems preoccupied in justifying his assumption that truth is possible to attain through demonstration, and he more or less assumes the prime truth of axioms. In the *Metaphysics*, however, after claiming that the philosopher is entitled to study the axioms since the axioms apply to being qua being, Aristotle goes on to name the most certain of axioms as the principle of contradiction.\(^{12}\) He follows this assertion with a lengthy discussion which attempts to justify this principle in terms of a basic meaning of "being." In the *Posterior Analytics* (assumed to be an earlier work than the *Metaphysics*), Aristotle still seems to be groping for accurate terminology so that he is not always consistent in his classifications of terms.\(^{13}\) Yet he clearly distinguishes "axioms" from "theses" so that the former comprises "what must be grasped if any knowledge is to be acquired."\(^{14}\) "Theses," which do not seem to carry with them the same inherent necessitating role in cognition, are further divided into "hypotheses" and "definitions." A later subdivision, "postulates," is added.\(^{15}\) He again speaks of axioms in giving a

\(^{12}\)Meta. IV, 1005 a 19-35; b 1-35.


\(^{14}\)Post. Ana., 72 a 17.

\(^{15}\)These terms shall be dealt with in distinguishing Aristotle's "postulational mode of demonstration."
general description of the elements of demonstration. Demonstration has three factors: 1) the conclusion which requires proof; 2) the knowledge of the underlying genus whose attribute is to be a predicate in the conclusion; and 3) the axiom on which the proof is based.\textsuperscript{16} Finally, axioms are cited when Aristotle again names the three parts of demonstration. He refers to axioms as that "upon which the demonstration is ultimately based."\textsuperscript{17}

In all three instances in which "axioms" are mentioned, there is consistency with the description in the \textit{Metaphysics} as the "most certain of all principles." Although Aristotle never gives a clear and concise enumeration of the axioms in the \textit{Posterior Analytics},\textsuperscript{18} he conveys the notion that the ultimate necessity of reasoning is based on the axioms, especially on that axiom whereby it is known that "the fact cannot be otherwise."\textsuperscript{19} These axioms, as that on which demonstration is based, provide the necessary connections for demonstration in the strict sense (\textit{\epsilon\piλως}).\textsuperscript{20}

\textsuperscript{16}Post. Ana., 75 a 38; 75 b 2.
\textsuperscript{17}Post. Ana., 76 b 14.
\textsuperscript{18}Aristotle at times seems to equate \textit{\delta\xi\iota\omicron\varphi\omicron\tau\alpha\tau\alpha} with the \textit{κοιναλι} \textit{\delta\varphi\chi\alpha\iota} so that, in addition to the principle of contradiction, the mathematical axioms are also included. Post. Ana., 76 b 21. Also cf. Post. Ana., Loeb ed., p. 34 n.
\textsuperscript{19}Post. Ana., 71 b 13.
\textsuperscript{20}Post. Ana., 75 b 25.
Aristotle is clear in distinguishing this strict and necessary demonstration from demonstration in an accidental sense (κατὰ συμβολὴν). The former type of demonstration rests on necessary and universal principles; the latter does not so that the conclusion may hold in this case but not necessarily in all cases. He further specifies that the axioms are grounds for strict demonstration whereas hypotheses and postulates offer demonstrations in a loose sense. Aristotle contends that the strict axiomatic demonstration "is conceived not with external but with internal discourse (ἐν τῷ ψυχῷ); and while it is possible to raise objections to external discourse, it is not possible to do so with internal discourse."22

This seems to be a most significant passage in highlighting Aristotle's rationalistic view of demonstration. The appeal that he makes seems clearly to be directed at the inner, natural necessity of reason. One must "see the light," as it were. "In his mind" he must realize the connection that necessitates that something is the case and cannot be otherwise. This natural necessity of the human mind to arrive at truth ultimately operates in virtue of the contradiction axiom. This latter principle--as axiom--is not a premise of a syllogism. Aristotle distinguishes axioms as the underlying principles of demonstration from the actual premises of syllogisms (which premises are usually definitions as seen in the Posterior Analytics, 75 b 31). Rather than serve as a

21Post. Ana., 75 b 22ff.

premise, the principle of contradiction provides the basis for uniting the premises in a necessary way.\textsuperscript{23} The process, of course, is a conceptual one and the rigidity of the demonstration is in proportion to one's awareness of the applicability of the contradiction principle. In other words, strict demonstration for Aristotle depends upon the conscious awareness that one's reasoning is supported by an indemonstrable axiom whose truth is irrefutable. In "seeing" the application of such a principle, one knows that something is the case and cannot be otherwise.

To call such a process an inner, mental one that is beyond dispute is not to disparage the role of language, according to Aristotle. Certainly, he himself pleads that a would-be denier of the ultimate axiom should utter something lest he be mistaken for a vegetable. And once something is uttered, then he can be shown the application of "the most certain principle."\textsuperscript{24}

Nor should it be thought that this absolute mode of demonstration in the thinking of Aristotle must necessarily rule out a less stringent and more probabilistic mode of reasoning. Absolute demonstration represents only one pole of the Aristotelian realm of reason. It represents the rationalistic tendency of, first of all, attributing to human reason the natural necessity of arriving at ultimate truth; and, secondly, it stresses that this natural necessity operates through the basic understanding

\begin{itemize}
\item \textsuperscript{23} \textit{Post. Ana.}, 88 a 36; 88 b 3.
\item \textsuperscript{24} \textit{Meta. IV}, 1006 a 1-28.
\end{itemize}
that it is impossible for something to be and not be at one and the same
time and under the same conditions. Without these two factors,
Aristotle's discussion of "universals," "indemonstrables," "prior and
more knowable," in short his discussion of strict demonstration, cannot
be properly understood.

Principles as Postulates

There is, perhaps, more favorable ground to be found for
establishing a postulational or hypothetical form of demonstration in
Aristotle's works in his treatment of the enthymeme and perhaps certain
forms of argumentation found in the Topics.

However, since the second Analytics is the more epistemological
treatment of demonstration, it may be well to begin there with Aristotle's
own distinction between the two modes of demonstration. First of all,
Aristotle leaves little doubt that probabilistic types of argumentation
come under the general scope of syllogistic demonstrations. In claiming
that demonstration proceeds from pre-existing knowledge, Aristotle
asserts that the same is true of enthymemes, "which are a kind of
syllogism." The assumption can be made, then, that Aristotle wishes
to include the less rigid forms of argument in his discussion of the value
of demonstration.

25 *Prior Ana.*, 70 a 5ff.
27 *Post. Ana.*, 71 a 11.
The distinction between strict demonstration and hypothetical demonstration rests on the degree of necessity wrought by the premises.

Hence of connections that are not eternal (οὐ̄ θεατρόν) there is no demonstration or knowledge in the strict sense, but only in the accidental sense that the attribute belongs to the subject not universally but at a given time or under given conditions. When this is so, the minor premise must be non-eternal and non-universal; non-eternal because only so will the conclusion also be non-eternal, and non-universal because the conclusion will be true in some cases but not in others, and so cannot be proved to be true universally, but only at a given time. 28

It is almost impossible to give a concise account of the type of premises that yield such non-strict demonstrations. Aristotle is neither clear nor consistent on this point. In one passage, under the general rubric of archai, he distinguishes the axioms of strict demonstration from "theses," "the grasp of which is not necessary for the acquisition of certain kinds of knowledge." 29 He then subdivides "theses" into "hypotheses" which either affirm or deny existence of something, and "definitions" which prescind from the existential question and simply assert what something is.

Later, in attempting another classification of premises, Aristotle removes "hypotheses" from the ranks of the indemonstrable and necessarily true and adds another type of premise—the postulate (αἰτία). 28


29 Post. Ana., 72 a 16.
"That which is in itself necessarily true and must be thought to be so is neither an hypothesis nor a postulate." ³⁰

The distinction between hypothesis and postulate is not clear. He seems to say that a postulate is an unproved premise not yet accepted by a listener of an argument, while an hypothesis is a premise that a listener will accept even though it has not been proven. ³¹

At any rate, both hypotheses and postulates are first principles (in the broad sense of "premises") which are not self-evident yet play an important part in demonstration--demonstration έξ υποθέσεως.

The following chart attempts to classify Aristotle's principles of demonstration. As many commentators have pointed out, Aristotle lacks precision of terminology and seems to be groping for a proper understanding of the basis for various types of arguments. The classification that follows falls into two main categories that correspond to the two types of argumentation--hypothetical and absolute.

³⁰Post. Ana., 76 b 23. Aristotle manifests what appears to be an inconsistency here. In 72 a 16-17, "theses" are said to be "immediate indemonstrable first principles of syllogisms...." "Hypotheses" are then included "under theses" as species is to genus. But in 76 b 23, "hypotheses" are said to be not necessarily true.

³¹Post. Ana., 76 b 27-34.
Principles and The Division of Sciences

Aristotle's insistence upon the division of sciences, each employing its own special principles, is indicative, first of all, of his rejection of any absolute master science which might demonstrate all archai, and, secondly, is indicative of his notion of demonstration in a "loose" sense. Concerning the former interpretation, Aristotle assumes a definite anti-Platonic stance by denying that a single archē is to be used for all demonstration. He very clearly states that demonstration is impossible unless conclusions are drawn from premises appropriate to the genus in question.32 There may be some disciplines which draw their principles from other sciences, but only if the latter science is in a "higher genus." In this case, the "fact proved belongs to a different science (for the subject genus is different), but the grounds of the fact belong to the superior

science to which the attributes belong per se."33 By way of example, Aristotle cites the principles of arithmetic which are used to prove facts in harmonics, the subalternate science. In spite of this "borrowing" of principles, Aristotle insists upon different and special sciences employing different and special principles. How, then, one might ask, can Aristotle consistently speak of "common principles"? He does so only in an "analogical sense."34 In explaining the meaning of analogical common principles, Aristotle first gives examples of a special principle—the assumed definitions of a line by a geometrician, and, secondly, the "equals from equals" principle of the mathematician. The geometrician may apply the common principle in deducing a conclusion about a line "if he assumes the truth not universally but only of magnitudes."35 The mathematician can use the same common principle in his own special way "if he assumes it only of numbers."36 The common principles are only "common after a fashion," i.e., Aristotle never intends the common principles to be universally applied in a univocal way throughout the sciences. If this were the case, there would not be "sciences," but rather "Science." Aristotle recognizes the diversity of sciences and their special principles; yet he desires to bind together this diversity, in some way, with common

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34 Post. Ana., 76 a 39.
35 Post. Ana., 76 b 1.
36 Post. Ana., 76 b 2.
principles analogously applied. And in calling the principles "analogous," the "binding" work does not destroy the diversity. We see here the same plan and pattern that Aristotle's theory of archai follows in the realms of nature.

There is, on the one hand, a clear-cut distinction between sciences and their principles (geometry's definition of a line is of no use to arithmetic). Yet there is a principle of arithmetic that can be used by geometry in dividing a line, if the principle is not used in geometry the way it is used in arithmetic. All of this implies that demonstration operates within a frame of reference that tempers quite considerably the meaning of "universal" in Aristotle's writings. In spite of all his appeals for strict demonstration to proceed from universal premises, he quite clearly indicates his meaning of universality. It is a kind of "relative" universality operating in a given frame of reference. When the geometrical applies the principle that "equals from equals give equals" to the concept of a line, he does indeed apply it to all lines. In this sense, the universality is relative to the concept of "line" within the framework of geometry. The principle, as Aristotle states, does not apply universally to all things in the same way. He envisions no universal science in which The One Principle explains all.37

He does hope for absolute demonstration, as we saw above. But now, perhaps, even this notion of strict demonstration is a bit

37 Perhaps Aristotle's most severe criticism of Platonic Forms occurs in the second Analytics in which he denies any relevance that Forms may have in demonstration and dismisses them as so much "whistling in the dark." Post. Ana., 83 a 33–34.
"relativized." "Thus it is evident from these considerations that absolute demonstration of any attribute is impossible except from its own principles." Absolute demonstration, then, is conditioned upon the knowledge of certain principles. If the fact and the reason for the fact are to be known as true, then appropriate primary facts must be known. And--tempering the "absolute" even further--Aristotle admits that these appropriate and primary principles are not always so clear. Knowledge is hard to come by.

It is difficult to be certain whether one knows or not; for it is difficult to be certain whether our knowledge is based upon the principles appropriate to each case (for it is this that constitutes true knowledge) or not. We suppose that we have scientific knowledge if we draw an inference from any true and primary premise, but it is not so; the inference must be homogeneous with the primary truths of the science.

All of this is no claim that Aristotle's "appropriate principles" of demonstration are the "hypothetical approximations" of science methods today. Nor is it claimed that his generic and specific classifications are identical with the frame of reference system of modern physics. Undoubtedly, Aristotle believed that the principles, even though varied, multiple and appropriate, were self-evident truths and objects of knowledge in their own right.

The claim is made, however, that the same polarity that permeates his natural philosophy also prevails in his theory of demonstration. That,

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38 Post. Ana., 76 a 14-16.

in addition to the rationalistic pole of absolute and necessary demonstration, there is a pole of hypothetical and postulational demonstration. This latter pole is exemplified 1) in the attempt of Aristotle (not a very successful one) to define such terms as 'hypothesis' and 'postulate'; 2) in his recognition of the special sciences and their appropriate principles; and 3) in his less stringent use of 'universality' insofar as it is conditioned by the particular sciences.

THE INTUITION OF FIRST PRINCIPLES OF DEMONSTRATION -

ANALYTIC OR INDUCTIVE?

When Aristotle finally approaches the problem of how the first principles of demonstration are apprehended, he seems to take an ambivalent course running from an analysis of terms with little or no appeal to sense experience, to an inductive process that is firmly grounded in experience. Since he clearly denies that first principles are arrived at by demonstration,\(^40\) and since sense perception per se cannot acquire the universality that characterizes the first principles,\(^41\) the only habit \((\varepsilon \varepsilon i s)\) of understanding \((\delta \iota \alpha \nu o \iota \alpha)\) that seems capable of reaching the first principles is intuition \((\varphi o \varepsilon i s)\).\(^42\) While it seems clear enough then that intuition is the mode of understanding the \textit{archai} of demonstration, it is not so evident how such intuition is effected.

\(^{40}\text{Post. Ana., 72 b 20; 100 b 9. Also Meta. IV, 1006 a 1-10.}\)

\(^{41}\text{Post. Ana., 87 b 28ff.}\)

\(^{42}\text{Post. Ana., 100 b 10-11.}\)
Analytical Intuition

Many followers of Aristotle have given an analytical type of interpretation of the intuition of principles. A great number of scholastic philosophers, for example, while maintaining that " nihil est in intellectu nisi quod prius fuerit in sensu," nevertheless affirm that knowledge of principles is purely a rational analysis of terms and concepts. Suarez, perhaps, best exemplifies this interpretation of the analytical intuition of first principles—especially the axiom of axioms, the principle of contradiction:

...not all principles are equal; in the first place there is one or another of the most general and best known; viz., anything either is or is not; it is impossible for the same thing to be and not be; for these to be known no experience is required but simply the apprehension, understanding or explanation of the terms.

Among modern scholastics, Garrigou-Lagrange restates "Aristotelian-Thomistic" thinking and claims that the principle of contradiction arises

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44 Franciscus Suarez, Disputationes Metaphysicae, I 6, N 27. The translation is mine. The original Latin reads: "...principia enim non omnia aequalia sunt. Est namque imprimit unum vel alterum generalissimum et notissimum scilicet: Quodlibet est vel non est; Impossibile est idem simul esse et non esse; et ad haec cognoscenda nulla requiritur experientia, sed sola terminorum apprehensio, intelligentia seu explicatio."
immediately from the concept of being which is known by the "first act of the intellect."

In the intelligible reality thus known, our intellect seizes at once its opposition to non-being, and an opposition expressed by the principle of contradiction: Being is not non-being. . . . Thus our intellect knows intelligible reality and its opposition to nothing, before it knows explicitly the distinction between me and non-me. . . . Next it comes to know the existence of this and that individual object, seized by the sense. In intellective knowledge the universal comes first; sense is restricted to the individual and particular. . . . Yet even in these primary laws we find a hierarchy. One of them, arising immediately from the idea of being, is the simple first principle, the principle of contradiction. 45

Aristotle, himself, does seem to tend toward this rationalistic analysis of terms which eventually yields a knowledge of first principles, and in particular the principle of contradiction. In the Metaphysics IV, he attempts to safeguard the knowledge and validity of "the most certain of all principles," even though it cannot be demonstrated. He begins his discussion by analyzing the terms 'being' and 'non-being' maintaining that a definite meaning is contained therein.

Thus in the first place it is obvious that this at any rate is true: that the term "to be" or "not to be" has a definite meaning; so that not everything can be "so and not so." 46

The appeal that Aristotle makes is based solely on an analysis of the meaning of terms. He then specifies his terminology by applying the terms to a particular term 'man.' The meaning of man must be thus and


46Meta. IV, 1006 a 29-31.
so (i.e., it must have a definite meaning) and it is impossible to attach more than one meaning to the term 'man,' for "not to have one meaning is to have no meaning." If it is agreed that "thus and so" is the meaning of 'man,' then "it is impossible that at the same time, the same thing should not be so... for 'to be necessarily so' means this: that it is impossible not to be so." Aristotle continues this analytical type of intuition of the contradiction principle by analyzing the meanings of 'substance' and 'accident' and 'essence.' If an infinite number of meanings could be read into 'substance' and/or 'essence,' then in effect all attributes are accidents and nothing is really "substantial" or "essential." Basically, he concludes, an understanding (intuition) of the principle of contradiction rests on one's understanding of something's γινόμενον, υπὸ τὸ τί ἐστὶν. Actually, at bottom, an analysis of the meaning of 'infinity' reveals the plausibility of the axiom. For, in all cases, the ultimate analysis is the impossibility of proceeding ad infinitum, whether it be an infinity of meanings of 'being' and 'non-being,' or an infinity of attributes predicated of "man."

According to Aristotle's treatment in the Metaphysics of the contradiction principle, therefore, knowledge of the basic axiom of demonstration

47Meta. IV, 1006 b 6–7.
48Meta. IV, 1006 b 33–34.
49Meta. IV, 1007 a 21–35.
is based solely on a theoretical analysis of terms and concepts. There is no substantial appeal made to sense experience.\textsuperscript{50} In fact Aristotle, at times, manifests a hostility toward sense perceptions when he admonishes those who would read an infinite number of meanings into 'being' and 'non-being' because of a belief that truth is found in appearances and sense perceptions.\textsuperscript{51} It would seem, then, that for Aristotle to know such a principle, the proper terms need only to be analyzed, or as Suarez states it—"the apprehension, understanding, and explanation of the terms."

That an analysis of terms reveals the self-evident axioms is also an interpretation given to Aristotle's treatment of axioms in the \textit{Posterior Analytics}, I 2. Aristotle simply states: "That which must be grasped if any knowledge is to be acquired, I call an axiom; for there are certain things of this nature and we are accustomed to apply this name especially to them."\textsuperscript{52} While this seems general enough to be rather innocuous, it should be noted that several lines above this passage Aristotle defines a proposition as either the affirmative or negative part of a contradiction. He states further that if demonstration is to be had then one or the other part of the contradiction must be assumed. This may not be necessarily so if the proposition is a "thesis" which may assume either part indifferently for the sake of dialectics. But one or the other part of a

\textsuperscript{50}Only once in the entire discussion does Aristotle refer to experience. He wonders why, if 'being' and 'non-being' have no definite meaning, a man will not walk into a well rather than around it. \textit{Meta.} IV, 1008 a 16.

\textsuperscript{51}\textit{Meta.} IV, 1009 a 1-13.

\textsuperscript{52}\textit{Post. Ana.}, 72 a 17-19.
contradiction must be assumed if there is to be true demonstration. Axioms bear the rank and dignity if one is to make the assumption. That is to say, axioms afford the necessary ground for the mental assertion that something is or is not the case and cannot be otherwise. Aristotle's explication of "axiom" as the sine qua non of all demonstration falls back on nothing more than the meaning of contradiction through an analysis of 'being' and 'non-being.'

Scholastic philosophers have generally interpreted Aristotle's axioms as those self-evident (per se nota) propositions that are revealed in the mind by analysis. In his commentary on the Posterior Analytics I a (a commentary on the same passage from Aristotle quoted above), Aquinas writes:

Some (principles) are truly called dignitates et propositiones maximae because of their certitude for making other things manifest. The truth of these dignitates is in all cases per se nota so that it is impossible to mentally conceive the contrary, even though one may speak it.\(^5\)3

What seems important in this interpretation by Aquinas is the relating of the self-evidence of the dignitates (axioms) to the mental conception of them. The rank of these first principles (at least the principle of contradiction) exalts them above sensory dependence. They carry in the mind their own warrant. Commenting again on the same passage in

\(^5\)3Thomas Aquinas, Commentaria in Aristotelem, Expositio Posteriorum Analyticorum, Lectio Quinta Editio Leonina, Vol. I, p. 156. The translation is mine; the original text reads: "Alia vero dicuntur dignitates et propositiones maximae, propter eorum certitudinem ad manifestandum alia. Harum dignitarum veritas est ita omnibus per se nota, ut nullus contrarium credere mente possit, etse ore proferat."
the second Analytics, Aquinas refers to the principle of contradiction and makes an explicit reference to the Metaphysics IV where the principle was "proved" by an analysis of 'being' and 'non-being.'

There is another (principle) which is called dignitas vel propositio which must necessarily be grasped in the mind and given assent to if anything is to be learned. It is evident that there are such principles as these, as it is proved in Metaphysics IV from this principle: that affirmation and negation are not true at the same time; the contrary of this cannot be mentally conceived, even though it can be spoken. 54

We have here an interpretation that definitely connects the axioms of the Posterior Analytics I 2 with those of the Metaphysics IV. Such an interpretation manifests a rationalistic tendency in Aristotle whereby the significance of sensory experience is diminished or disregarded altogether, and the exalted and noble first principles of demonstration are grasped by a mental analysis.

Inductive Intuition

While the texts cited above seem to provide sufficient warrant for a rationalistic grasping of first principles, Aristotle makes a very definite empirical commitment that results in the enigma of his polarity. 55

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54Ibid., p. 158. The translation is mine; the original reads: "Aliud vero est, quod dicitur dignitas vel maxima propositio quam necesse est habere in mente et ei assentire quemlibet, qui doceri debet. Et manifestum est quod quaedam principia talia sunt, ut probatur in IV Metaphysicae de hoc principio: quod affirmatio et negatio non sunt simul vera, cujus contrarium nullus mente credere potest et si ore proferat."

55The term 'polarity' or 'bipolarity' has been used throughout this paper to indicate that neither the rationalistic nor the empirical tendency
First of all, demonstration would be impossible without the universal archai from which it proceeds. However, since there can be no infinity of demonstrations, the universal premises are not themselves demonstrated but rather are objects of an inductive process (ἐπαγωγή).

"It is impossible to gain a view of universals except through induction . . . ." Furthermore, Aristotle insists that induction could not be possible without the experiences effected through sense perceptions.

We cannot employ induction if we lack sense perception, because it is sense perception that apprehends particulars. It is impossible to gain scientific knowledge of them, since they can neither be apprehended from universals without induction, nor through induction apart from sense-perception.

In short, 1) demonstration is impossible without universal premises; 2) the grasping of such premises is impossible without induction; 3) induction is impossible without sensory experience. Demonstration, therefore, basically rests on sensory experiences of particular events that somehow "lead on to" (ἐπαγωγή) universals.

in Aristotle is found in its pure state. To interpret Aristotle as either wholly rationalistic (as some scholastics have done) or as wholly empirical (as some moderns have done, e.g., Anton, Randall) necessitates a careful selection of certain texts and an exclusion of others. The bulk of the Aristotelian text, however, bears the bipolar tendency in which the rationalistic includes the empirical and the empirical contains the rationalistic.


58 Post. Ana., 81 b 2-3.

59 Post. Ana. 81 b 5-9.
Later in the second Analytics, Aristotle gives a more specific account of how the principles are grasped by induction. Repeated sense perceptions form a memory pattern, the organization of which constitutes an "experience" (ἐμπειρία): "... because the memories, though numerically many, constitute a single experience." Aristotle's notion of induction proceeds from the sensing of individuals, to the repeated memories of individuals, to the single experience. Demonstration may well be the "scientific" mode of deducing facts and their reasons, but all of this is impossible without the inductive grasping of the principles of demonstration, i.e., the primary premises. "Clearly then it must be by induction that we acquire knowledge of the primary premises, because this is also the way in which general concepts are conveyed to us by sense perception." And later in the Ethics, he writes:

Now induction supplies a first principle or universal, deduction works from universals; therefore there are first principles from which deduction starts, which cannot be proved by deduction; therefore they are reached by induction.

Not only does Aristotle describe the process of arriving at a knowledge of the first principles, he also names the faculty (ἕξις) that directs the process and realizes its completion. He asserts that of all

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60 Post. Ana., 100 a 5-6. Cf. also Meta. I, 980 b 30; 981 a 2. "It is from memory that men acquire experience, because the numerous memories of the same thing eventually produce the effect of a single experience."

61 Post. Ana., 100 b 3-4.

the intellectual endeavors only scientific knowledge (ἐπιστήμη) and intuition (νοῦς) operate in the realm of certitude, but scientific knowledge is structured along demonstrative lines (ἀποδεικτικά) and cannot effect a knowledge of first principles. By a process of elimination, then, nous is said to be the power behind the acquisition of first principles. First principles are known through inductive intuition.

In linking intuition with induction in his theory of knowing the principles, Aristotle lays heavy emphasis on the external senses, memory and experience as the necessary conditions of all knowledge, not only of the first principles.

The very linking of the terms 'induction' and 'intuition' presents several difficulties. First of all, 'intuition' tends to signify an element of immediacy in knowledge. Such an "immediacy," of course, is precisely what Aristotle needs for the grasping of the immediate first principles. Once such knowledge is had, then demonstration can proceed through its mediating terms. Induction, on the other hand, conveys the notion of a process in which we are "led on" from one step to the next. In other words, induction does not seem to be immediate; and one wonders how Aristotle can link the "immediacy" of intuition with the "steps" of induction. Yet Aristotle would insist that the knowledge of first principles is gained in this way. The answer may be that Aristotle refers to the immediacy of knowledge to distinguish from demonstrative knowledge which needs a middle term. Thus intuition of the principles is immediate in the sense of "non-demonstrative" and, therefore, not needing a middle term as cause
of the fact. Intuition, on the other hand, is not immediate in the sense of "needing no other in order to effect the knowledge." On the contrary, the intuitional apprehension of the principles necessarily depends upon "the sense perception which gives rise to memory and the repeated memories of the same thing which gives rise to experience." The intuitional insights can only be had after a process of repeated events; the process bears the Aristotelian rubric of "induction"; the repeated events, "experience."

Aristotle, of course, never clearly explains the nature of intuition and its relation to experience. Is nous the sum total of physical experiences depending upon the enumeration of single instances? Is nous a spiritual function that imposes rational order on the sequence of experiences? There does not seem to be sufficient warrant in the texts of Aristotle to give adequate answers to these questions. Indeed, the Aristotelian texts have done much to formulate these problems and others in the history of philosophy. What Aristotle's texts do imply is a double tendency: first, there is the importance and necessity of sense experience for human knowledge; secondly, there is the tendency to establish a mode of understanding as overriding this experience. Concerning his claims to how one knows first principles, the inductive intuition approach puts greater stress on the role of experience, while the analytical intuition interpretation emphasizes more the superiority of intuitive reason. If the latter is at fault because it plays down the importance of sensory experience, the former does not explain the importance of experience.

63 Post. Ana., 100 a 4-5.
PRINCIPLES AS ONTIC AND PRINCIPLES AS AXIOMATIC

In the very beginning of this work, it was hinted that the term "principle" carried a dual meaning. The first is an objective meaning whereby "principle" signifies the cause of something prescinding from one's knowledge of such a cause. The second meaning designates a subjective role in which principle as reason relates what-there-is to one's conceptual understanding. Principle as cause, therefore, emphasizes the ontic ground of what-there-is; principle as reason emphasizes the epistemic value of understanding what-there-is.

Aristotle attempts to unite these meanings of "principle" under one study, First Philosophy, without destroying the distinction of meanings. He raises the problem of whether or not the discipline that investigates the first principles of being should also investigate the first principles (axioms) of demonstration. His answer is an emphatic affirmative, maintaining that

... the investigation of these axioms too pertains to one science, namely the science of the philosopher; for they (axioms) apply to all existing things and not to a particular class separate and distinct from the rest. Moreover all thinkers employ them—because they are axioms of being qua being. ...

64 In citing this "objective" meaning of 'principle,' we are not necessarily maintaining that things exist in themselves apart from any knowing subject. Rather, the "objective" meaning of 'principle' as "cause" signifies a shift of emphasis to the ontic ground without emphasizing the relational role of cognition.

65 *Meta.* III, 995 b 7-12.

Both in his formulation of the problem and in his resolution, Aristotle gives strong indication that the principle of contradiction is not only a *causa* (an ontological principle of being), but a *ratio* as well (an epistemic principle of knowing).

In formulating the problem, Aristotle tells what he means by axioms giving first an epistemic meaning, "... that everything must be either affirmed or denied." He immediately gives the more ontological expression "... and, it is impossible at one and the same time to be and not to be." After the problem is solved by Aristotle and he is assured that it is the philosopher's task to study principles of being and principles of demonstration, he again states the axiom of axioms in its dual implication. First he gives the cognitional expression whereby it is impossible to predicate contrary attributes of the same subject at the same time; and, secondly, he states that it is impossible to imagine that the same thing "is" and "is not."

Here the assumption is made that reality is intelligible. Whatever may follow in Aristotle's thought must assume as indemonstrable that things-that-are can be conceptually uttered with meaning. Being is basically mind-related. That an inseparable link exists between things-that-are and things-that-are-uttered-conceptually is unquestionable, and the chain that links them together is the principle of contradiction. Being and being's

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67 *Meta.* III, 996 b 29.


69 *Meta.* IV, 1006 b 17-34.
intelligibility are founded on the same principle. The distinction that can be made is based on one's point of view. Objectively considered (i.e., considering the object known), things are and cannot not be; subjectively (i.e., considering the subject who knows), one cannot say that the same thing "is" and "is not" at the same time. This principle that has a double character is so foundational and primary that it rests on no previous hypothesis. 70

It was already noted above in a previous chapter that too rationalistic an interpretation has been given to Aristotle's principles of contradiction and excluded middle. He, himself, while exalting these principles as the basic assumption of all that is and is meaningful, is aware of the difficulty in employing such principles. This is especially true in the face of future contingencies when it is not certain what must be the case. Something may or may not happen in the future. We have no absolute knowledge of impending events, but neither are such events completely devoid of meaning. We are able to project some meaning into contingencies by postulating alternatives which ultimately draw meaning from the contradiction axiom. For example, there may or may not be a sea battle tomorrow; but at least this much is certain: either there will be a battle or there will not. Both alternatives cannot be accepted; both alternatives cannot be rejected. And without this assumption, all speculation and all "reality" is meaningless. 71

70 *Meta*. IV, 1005 b 16.

71 *De Interpretatione*, 19 a 32.
This dual meaning of "principle" coincides with the bipolarity in Aristotle's philosophy. Principles as reasons tend toward a rationalistic expression of what-there-is; while principles as ontic causes offer a more flexible and less rigid realization of contingent events.

The meaning of Aristotelian "Science" is also affected by the ambivalence of archai. And too often a strict meaning of "science as that which demonstrates" is associated with Aristotelian epistēmē. Aristotle's use of the term is much broader than this and a more complete understanding of it will help to explicate further his theory of archai and also his meaning of wisdom and/or philosophy.

THE MEANINGS OF "SCIENCE"

It was said above that Aristotle feels that he has solved the problem of whether or not one science (First Philosophy) should study both rationes essendi and rationes demonstrandi. The problem is solved by assuming a rational character in being based primarily on the principle of contradiction. However, the basic problem that is engendered may be so urgent that perhaps one's very meaning of philosophy awaits the answer. The problem takes on many forms and subsidiary expressions: What is the nature of this "science" of First Philosophy that seeks such universal certitude? Is a science demonstrative, working from given premises to a conclusion? Are the first principles that the philosopher seeks premises or conclusions? If they are premises, then are they not hypotheses? Yet Aristotle has
maintained that the most certain principle is \( \delta \pi \theta \varepsilon \sigma \iota s \).\textsuperscript{72}

If they are conclusions, then is something prior to them? Basically, the problem involves the meaning of Aristotelian science; more specifically, it involves the meaning of the term \( \varepsilon \pi \iota \sigma \tau \varsigma \mu \eta \).

Throughout the *Metaphysics*, Aristotle refers to the \( \varepsilon \pi \iota \sigma \tau \varsigma \mu \eta \) under consideration. Book IV begins with \( " \varepsilon \pi \iota \sigma \tau \varsigma \mu \eta \ \tau i s \ \varsigma \ \theta e \omega \rho e i \ \tau \delta \ \delta u \ \iota \ \delta u . . . . " \textsuperscript{73}

A difficulty appears when the role of demonstration arises in connection with \( \varepsilon \pi \iota \sigma \tau \varsigma \mu \eta \). Aristotle himself recognizes this problem in the *Posterior Analytics* I 3 in which he argues for the scientific knowledge (\( \varepsilon \pi \iota \sigma \tau \varsigma \mu \eta \)) of first principles even though those principles are not demonstrable (\( \alpha \pi \delta \varepsilon \iota \kappa t i k \kappa \)). Failure to distinguish \( \varepsilon \pi \iota \sigma \tau \varsigma \mu \eta \) from \( \alpha \pi \delta \varepsilon \iota \varsigma i s \) places Aristotle in the difficult situation of having to demonstrate the indemonstrable. Owens sees the difficulty:

But at this stage (the establishing of indemonstrable principles) the dialectical approach brings to light a rather embarrassing situation. The first principles of wisdom, the separate Entities are not immediately evident. If they are the first principles of wisdom, how can they be established by Aristotelian dialectic? They have to be demonstrated. The things that are primarily knowable in themselves do not seem to be primarily knowable in regard to human cognition. How then can they be discovered by the dialectical scrutiny?\textsuperscript{74}

\textsuperscript{72}Meta. IV, 1005 b 16.

\textsuperscript{73}Meta. IV, 1003 a 20.

\textsuperscript{74}Owens, op. cit., p. 180.
In a brief commentary on Aristotelian science, J. H. Randall at times seems to distinguish science from demonstration and at other times identifies the terms.

The *Posterior Analytics* undertakes to analyze what science is, and how to use language, *logos*, as an instrument, *organon*, to formulate and express it. In the *Posterior Analytics* Aristotle thus answers the question raised in the *Theaetetus*: What is *epistēmē*, science? Aristotle's answer runs: We "just know," we have genuine "science" *epistēmē*, when we can state in precise language not only that things are so, *hōtī*, but also why they are as they are, *dioti*, and why they have to be that way.75

So far Randall has identified *ἐπιστήμη* as knowledge of causes without any particular association of that knowledge with causal relation to previous knowledge. He then continues identifying *ἐπιστήμη* entirely with demonstration in which the knowledge is scientific because it is deduced from "more fundamental truths."

We possess science when we can prove and demonstrate statements about them, by relating those statements to other statements of which they are the necessary consequences. "Science" is thus for Aristotle a knowledge of the why's, the *diotis*, the "reasons for" true statements. It is a knowledge of the dependence of true statements on more fundamental truths, on "first things" *ta prota*, or "causes," *aitia*. Science, that is, is like geometry, the model Aristotle clearly has in mind, as the one fully developed and formalized science the Greeks had managed to achieve, in which theorems are demonstrated from initial axioms and definitions. . . . Science is thus demonstration, *apodeixis*. As in geometry, it demonstrates the reasons why, *ta dioti*, things are as they are observed to be, and why they must be so, and it demonstrates these reasons why from "first things," *ta prota*.76

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76Ibid., pp. 34-35.
According to Randall's meaning of ἐπιστήμη, it is not distinct from ἀπόδειξις; and one would have to conclude that in the Metaphysics where Aristotle speaks of a science (ἐπιστήμη) of first principles and causes, he is either misusing the term "ἐπιστήμη" (if first philosophy is not demonstrative) or he intends first philosophy to be productive of knowledge deduced from the ἀρχαί (which it never seems to be).

In Ross' excellent Greek edition and commentary on the Metaphysics, he seems to recognize a distinction between science and demonstration:

> In the first place, though he (Aristotle) calls metaphysics a science, he does not suppose that it is demonstrative through and through. No science is that. Every science starts with ἀριτμοὶ and ὑπόθεσις, unproved definitions of all its terms and unproved assumptions that there exist objects corresponding to the chief of those terms. These unproved propositions are its ἀρχαί.77

Even here Ross' meaning of science is not quite clear. What does he (Ross) mean by stating that metaphysics as a science is not "demonstrative through and through"? And that like all other sciences, metaphysics must assume its ἀρχαί? Does this mean that given the first principles in the Metaphysics, Aristotle is then going to demonstrate being qua being? And that insofar as being qua being is demonstrated from the ἀρχαί --to that extent metaphysics is a science? And insofar as the ἀρχαί are indemonstrable, then metaphysics is not a "through and

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through" science? If this is what Aristotle means, it is not what he seems to say. First of all, metaphysics is a science that does not rest on διάθεσις.

As it was quoted above: "For the principle which the student of any form of Being must grasp is no hypothesis (τὸ οὖν οὐχ ἔνθεσις)." 78

It is true as Ross states that the ἀρχαί are unproved (and one might add unprovable) assumptions, but they (ἀρχαί) are not hypothesis in the sense of leading to further conclusions. First Philosophy is simply the exposing of the irreducible principles of being as such. It can be called ἐπιστήμη by Aristotle since he uses the term in a generic sense indicating causal knowledge without any specific reference to conclusions deduced from those ἀντία καὶ ἀρχαὶ. When he makes specific reference to demonstrative knowledge, he usually couples the words "ἀφοδεικτικὴ ἐπιστήμη." 79 Ross indicates the frustration one will experience upon waiting for Aristotle to deduce conclusions in his metaphysical "science."

So far Metaphysics is doing only the preliminary work of a science, the formulation and in some cases the commendation of definitions and hypotheses. Does it ever proceed to the main work of a science, the drawing of conclusions from these? It seems that the answer must be in the negative. The procedure throughout the Metaphysics remains aporematic. A moments comparison of its procedure with that of geometry, for instance, will show the difference. Aristotle's frequent description of metaphysics as the science of principles itself suggests that it is not meant to get beyond principles to conclusions. 80

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78 Meta. IV, 1005 b 15-16.

79 Cf. Post. Ana., 71 b 20; 72 b 19; 76 a 36; 76 b 11-12.

80 Ross, op. cit., p. 252.
The more important point that Ross does not raise is this: If metaphysics is not intended to deduce conclusions from the ἀρχαὶ (which—the feeling here is—it is not), then can Aristotle legitimately call it a science (which he does)? Concerning the latter point, i.e., Aristotle's use of ἐπιστήμη in reference to metaphysics, the textual use of the term appears to prescind from any question of demonstrating conclusions from the ἀρχαὶ. Rather ἐπιστήμη is simply a knowledge of principles. In the Metaphysics, what are investigated are the first principles and the highest causes so that the knowledge (ἐπιστήμη) is the knowledge of a philosopher—i.e., it is wisdom (σοφία).

"Thus it is clear that Wisdom (σοφία) is knowledge (ἐπιστήμη) of certain principles (τινὰς ἀρχὰς) and causes (αἰτίας)."\(^{81}\)

And again in the next chapter:

"Since we are investigating this kind of knowledge (ἐπιστήμη), we must consider what these causes (αἰτίας) and principles (ἀρχὰς) are whose knowledge (ἐπιστήμη) is Wisdom (σοφία)."\(^{82}\)

From these passages it seems fairly clear that Aristotle is using the term "ἐπιστήμη" in some sort of alignment with wisdom. In doing so he prescinds from any connection "ἐπιστήμη" may have with "ἀπόδειξις." In the Posterior Analytics, after Aristotle claims the importance of knowing and proceeding from indemonstrable first

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\(^{81}\)Meta. I, 982 a 1-2.

\(^{82}\)Meta. I, 982 a 3-5.
principles, he proceeds to state two views contrary to his own; viz., that there is no knowledge since all knowledge must be demonstrative and the ἀρχαί are not demonstrable; and, secondly, that there is knowledge since all facts are demonstrable including the ἀρχαί. In stating his own view Aristotle maintains that there is knowledge and yet the ἀρχαί are not demonstrable.

"We, however, hold that not all knowledge (ἐπιστήμη) is demonstrative (ἀποδεικτικὴν)." This type of non-demonstrative ἐπιστήμη grasps the first principles from which demonstration proceeds and indeed this type of ἐπιστήμη has its own principle, i.e., a psychological principle, νοῦς. He continues:

The knowledge of immediate premisses is not by demonstration. It is evident that this must be so; for if it is necessary to know the prior premisses from which the demonstration proceeds, and if the regress ends with the immediate premisses, the latter must be indemonstrable. Such is our contention on this point. Indeed we hold not only that ἐπιστήμη is possible, but that there is a definite first principle of knowledge (ἀρχὴν ἐπιστήμης) by which we recognize ultimate truths.

All well and good! Not every ἐπιστήμη is demonstrable; there is an ἐπιστήμη of highest principles that constitutes wisdom. But can this be reconciled with the claim in the second Analytics that there can be no ἐπιστήμη of first principles?

Now of the intellectual faculties that we use in the pursuit of truth some (e.g., scientific knowledge ἐπιστήμη and intuition νοῦς) are always true, whereas others

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84 Post. Ana., 72 b 21-25.
(e.g., opinion and calculation) admit falsity; and no other kind of knowledge (ἐπιστήμη) except intuition (νοῦς) is more accurate than scientific knowledge (ἐπιστήμη).\(^8\) Also first principles are more knowable than demonstrations, and all scientific knowledge involves reason. It follows that there can be no scientific knowledge (ἐπιστήμη) of the first principles (τῶν ἀρχῶν) and since nothing can be more infallible than scientific knowledge except intuition, it must be intuition that apprehends the first principles.\(^8\)

There appears, of course, to be a contradiction, which would be a rare paradox indeed that Aristotle in his exposition of the principle of contradiction should contradict himself. In the Metaphysics Aristotle argues that there is an ἐπιστήμη of first principles; in the Posterior Analytics he claims that there is no ἐπιστήμη of first principles. In the Ethics he likewise states that ἐπιστήμη cannot provide the knowledge needed to grasp the ἀρχαί:

Scientific knowledge (ἐπιστήμη) is a mode of conception dealing with universals and things that are of necessity; and demonstrated truths (ἀρχαὶ τῶν ἀποδεικτῶν) and all scientific knowledge (παρὰ ἐπιστήμης) -- since this involves reasoning -- are derived from first principles. Consequently the first principles from which scientific truths are derived cannot themselves be reached by science.\(^8\)

\(^8\) Again ἐπιστήμη is used as distinct from the implication of demonstration. This distinction is even clearer in the passage immediately following the above quote in which he states: "This (i.e., that νοῦς grasps ἀρχαί) is evident not only from the foregoing considerations but also because the starting point (ἀρχή) of demonstration (ἀποδείξεως) is not demonstration (ἀποδείξις), and so the starting point of scientific knowledge (ἐπιστήμη) is not itself scientific knowledge ἐπιστήμη." Post. Ana., 100 b 12-14.

\(^8\) Post. Ana., 100 b 5-11.

\(^8\) Nic. Eth., 1140 b 31-35.
This apparent difficulty can be avoided if one realizes in the Aristotelian texts two meanings of επιστήμη. First of all, there is a strict and proper use whereby conclusions are deductively demonstrated from first principles. In this meaning of επιστήμη, demonstration (ἀπόδειξις) is its principal quality (ἐξής). Perhaps the subscript "alpha" will best convey this meaning of επιστήμη and its chief quality of ἀπόδειξις. επιστήμηα, then, is knowledge in the strict sense, i.e., deductive knowledge demonstrating from first principles. However, επιστήμη also has a more analogous meaning. This type of knowledge is no less certain than επιστήμηα since it too grasps the necessary and eternal; but its method is inductive whereby it grasps basic concepts and principles. Since νοῦς is the principle of this inductive knowledge of first principles, we subscript "nu" to επιστήμη so that επιστήμην designates knowledge that is not strictly scientific but analogously so, inasmuch as the principles of demonstration must be known with intuitive certitude before demonstration itself can be accomplished. The distinction can be expressed schematically:

επιστήμηα

- 1. science in the strict sense
- 2. deductive
- 3. employing ἀπόδειξις from first principles

επιστήμην

- 1. analogous meaning of "science"
- 2. inductive
- 3. employing νοῦς as the ultimate principle of grasping first principles
The passage that best contains all of the above distinctions is Aristotle's attempt to define \( \varepsilon \iota \sigma \tau \iota \mu \eta \) in the sixth Book of the Nicomachean Ethics.

The nature of \( \varepsilon \iota \sigma \tau \iota \mu \eta \) --employing the term in its exact sense and disregarding its analogous uses--may be made clear as follows. We all conceive that a thing which we know scientifically cannot vary; when a thing that can vary is beyond the range of our observation, we do not know whether it exists or not. An object of \( \varepsilon \iota \sigma \tau \iota \mu \eta \) therefore, exists of necessity. It is therefore eternal, for everything existing of absolute necessity is eternal; and what is eternal does not come into existence or perish. Again it is held that all \( \varepsilon \iota \sigma \tau \iota \mu \eta \) can be communicated by teaching, and that what is scientifically known must be learned. But all teaching starts from facts previously known, as we state in the Analytics, since it proceeds either by way of induction, or else by way of deduction. Now induction supplies a first principle or universal, deduction works from universals; therefore, there are first principles from which deduction starts which cannot be proved by deduction; therefore, they are reached by induction. \( \varepsilon \iota \sigma \tau \iota \mu \eta \) therefore, is the quality whereby we demonstrate, with the further qualifications included in our definition of it in the Analytics, namely, that a man knows a thing scientifically when he possesses a conviction arrived at in a certain way, and when first principles on which that conviction rests are known to him with certainty—for unless he is more certain of his first principles than of the conclusion drawn from them, he will only possess the knowledge in question accidentally. Let this stand as our definition of \( \varepsilon \iota \sigma \tau \iota \mu \eta \).

With \( \varepsilon \iota \sigma \tau \iota \mu \eta \) including both possibilities of deductive demonstration and inductive apprehension of principles, Aristotle can now call First Philosophy the investigation of an \( \varepsilon \iota \sigma \tau \iota \mu \eta \) that seeks out the \( \varphi \chi \alpha \iota \) and whose knowledge is wisdom. For wisdom is a kind

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88 This precise sentence "\( \varepsilon \iota \sigma \tau \iota \mu \eta \ \varepsilon \sigma \tau \iota \nu \ \varepsilon \xi \iota \ 
\alpha \pi \theta \delta \varepsilon \varepsilon \kappa \tau \iota \kappa \eta \)" is the expression of \( \varepsilon \iota \sigma \tau \iota \mu \eta \).

89 Nic. Eth., 1139 b 18-35.
of ἐπιστήμη. In fact it (σοφία) is a combination of ἐπιστήμη (i.e., knowledge acquired by intuiting first principles) and ἐπιστήμηα (i.e., knowledge acquired by demonstrating from first principles).

The wise man therefore must not only know the conclusions that follow from his first principles, but also have a true conception of those principles themselves. Hence Wisdom must be a combination of Intelligence (νοῦς and Scientific Knowledge (ἐπιστήμη).90

And again in the Ethics, he writes:

"These considerations therefore show that Wisdom is both Scientific Knowledge (ἐπιστήμη) and Intuitive Intelligence (νοῦς) as regards the things of the most exalted nature."91

Wisdom is a definite sort of knowledge—an ἐπιστήμη that simultaneously knows its principles through an intuiting νοῦς-principle (ἐπιστήμη) and knows its certain conclusion by demonstration from those principles (ἐπιστήμηα).

Not only do first principles provide a point of common ground for intuition and demonstration, but also their all-pervasive priority renders consistent the solution to the problem Aristotle had raised in the Metaphysics, viz., whether the same ἐπιστήμη that studies principles of being should also study principles of demonstration. The primary principles have a dual purpose. Being and being's demonstrability are both rooted in the same source. Hence, if one accepts Aristotle's ἐπιστήμην

90Nic. Eth., 1141 a 17-19. According to our distinction, this meaning of ἐπιστήμη would have the alpha subscript.

91Nic. Eth., 1141 b 2-3.
of being qua being (metaphysics), one also accepts his ἐπιστήμη of being qua demonstrable (methodology). And the important point here is this: one will accept the Aristotelian "sciences" of first philosophy and demonstration if one accepts his notion of first principles. Nothing else holds such an esteemed position in his entire philosophy than what he considers to be the basic and ultimate and prime reasons why something is the way it is and could not be otherwise without involving another kind of principle. To what extent have the "principles" of Aristotle been accepted? From an ontological point of view, do the principles provide the structural priority that Aristotle claims? How self-evident, eternal and invariable are the primary principles? Or are these latter notions simply a restatement of Platonic Ideals freed from the myth and poetics of Aristotle's great teacher? From the point of view of methodology and/or demonstration, how much do the "new sciences" born of the Copernican revolution owe to the ἐπιστήμη of Aristotle nurtured as it is on first principles? If the primary principles do not give the knowledge or wisdom that will satisfy man, must they be replaced by working approximations which in turn give way to further hypotheses? Is philosophy's task autonomous—establishing conclusions from principles independent of further empirical findings? Or is philosophy's prime principle that whereby the entire range of scientific endeavors is ordered and reshaped according to new findings?


An examination of Aristotelian texts reveals no single answer to these questions. Aristotle's realm of Reason and its principles of demonstration follow more or less the same pattern as his realms of Nature. An analogous use of basic, irreducible principles exhibits a bipolar tension. At one pole there is stress on the a priori, the necessary, the Absolute. Ultimately, nous is the underlying principle of principles at this pole, whether it is the intuition of axioms in the second Analytics or the Pure Act of thinking in the Metaphysics. Concerning Aristotle's principles of demonstration, this rationalistic pole takes the form of strict reasoning, i.e., absolute connection between self-evident, universal premises that yields a certain and indubitable conclusion.

At the other pole, there is the recognition of contingency, the relative, the individual being or event that may or may not be. Basically, experience is the underlying guide. In demonstration, this pole of thought tempers the mode of reasoning. Postulates and hypotheses are offered, necessity is conditioned by various assumptions; and probability, or at least the "probable" (ἐκκόσιος) finds its way into the Aristotelian scheme of demonstration.

This bipolar play in Aristotle's thought prevents any extreme principle (νοῦς or ἐμπειρία) from assuming exclusive rights as Cause (ontic) or Reason (epistemic) of all things. Aristotle, therefore,

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is neither Rationalist nor Empiricist (Naturalist). Yet, considered together, he is both Rationalist and Empiricist, for throughout his works reason is at work discovering the "principles" of experience and nature.
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I, Joseph J. Romano, was born on November 30, 1934 in Conshohocken, Pennsylvania, the son of Anthony Romano and Marguerite Forte Romano. I received my elementary and secondary education in the public school system of Conshohocken. In 1958 I earned a Bachelor of Arts Degree in Philosophy from St. Charles Borromeo Theological Institute which offered, in addition to the Philosophy program, a wide background in classical studies. At St. Charles I was awarded the gold medal for academic excellence in Ancient History. In 1962 I received the Master of Arts Degree in Philosophy from Villanova University and delivered the graduate student address at commencement. I entered Bryn Mawr College in September 1963 and concentrated upon the historical approaches to Philosophy. I attended seminars under the direction of Miss Isabel S. Stearns, Mr. George L. Kline and Mr. José Ferrater Mora, each one of whom I thank for sharing with me their wealth of philosophical knowledge. My courses were arranged under the direction of
Mr. Milton C. Nahm to whom I am indebted for his encouragement and personal interest in my career. In September 1965 I received a tuition scholarship from Bryn Mawr College, and the following year successfully completed the preliminary examinations in the areas of Greek Philosophy, Seventeenth Century Rationalism, The Theoretical and Practical Philosophy of Kant, and Phenomenology. My work on the dissertation was carried out under the direction of Professor Ferrater Mora to whom I am most grateful for his invaluable suggestions and patient guidance.

I am married to the former Jeanne M. Hart of Valley Forge, Pennsylvania. We have a daughter, Elizabeth, who is four-years-old. No small amount of thanks is due to my wife who typed both the first draft and the final copy of my dissertation. Currently I am teaching Philosophy at Cabrini College, Radnor, Pennsylvania.