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INTRODUCTION

The subject of this paper is the role played by the material principles of things in the economy of nature. Our consideration of this question will lead us to present and analyze three positions, two of which are complementary. The first position is that of materialism, in which it is held that the role of the material principles is all-dominant and absolute. The second theory maintains, in precise opposition to materialism, that the material principles have an essentially subordinate and instrumental function in the works of nature. However, within the limits set be such a subordination, the advocates of the second position acknowledge and, indeed, stress the relative dominance of the material principles in many natural phenomena. This is the third view we are to consider.

The title we have chosen for this work designates events in which a relative dominance of the matter is actually found. For in its most proper signification, the expression <u>ex necessitate materiae</u> refers to certain natural phenomena in which the material principles depart from their ordination to the end, and in which, therefore, the matter is the proper cause. Instances of such phenomena are the infinite variety of predicable accidents, the many physical defects to which all living beings are subject and substantial corruption itself. Characteristics and events such as these are simply necessary consequences which flow from the material nature of the beings affected: given

the matter, they must follow. And the matter is stated to be the proper cause inasmuch as the events in question are beyond and contrary to the intentions of nature; they thus have no final cause, no end for the sake of which they come to be.

The title of this paper also - though, as we shall see, somewhat less properly - denotes the erroneous theory of the generation of natural things held by ancient and modern materialists. In this theory, the final cause is in principle negated, and the end is viewed as merely the necessary result of the material conditions involved in its realization. Thus Empedocles, for one, maintained that the properties of living beings that are ordered to their survival are wholly fortuitous with respect to this end, and that they come to be solely as the necessary term of particular physical processes. This view is, of course, extended to include the end of any and all natural operations. Here, accordingly, the material principles are stated to be all-supreme in the coming-to-be of natural things.

By extension, ex necessitate materiae may be considered to designate the philosophy of materialism in its entirety. This philosophy, as we suggested above, reduces all of natural existence and, by that fact, all causality in nature to the material elements and the laws that govern their behavior. All else is considered to be wholly derivative in character, and either possessed of a second-rate and epiphenomenal mode of existence or traced to man's tendency

to impose human notions upon reality. For the natural thing is asserted to be, in its very substance, the material elements that compose it. It is as a corollary of this that the formal principles of things are either denied or relegated to the status of accidental dispositions or organizations of the common materials. This belief has received a concise formulation from Empedocles:

> Nothing is that has a nature,
> But only mixing and parting of the mixed,
> And nature is but a name given them by man. (1)

The material elements are, in turn, held to be the only active principles (this statement is subject to certain qualifications to be noted later) in the generation and posited evolution of natural things. Among the moderns, the thesis is that the higher forms of existence are derived from the lower. The final assertion of the materialists is that sketched in a preceding paragraph, which negates the causality of the end and posits that all in nature is but a necessary product of the matter.

Thus it is with these related notions that we are here concerned. And it is the purpose of this work to ascertain the extent to which the material principles account for and determine the existence, coming-to-be and properties of natural things. In the realization of this end, the first position to be considered will be that which affirms the universal dominance of matter in nature - that position which defines the philosophy of materialism. Our consideration of this philosophy will

take the form of an exposition of its assertions and arguments regarding the causes of natural things and the kind of necessity found in their generation. Following this, we shall endeavor to show the inadequacy of materialism with respect to each of these assertions. In so doing, we shall establish the fundamentally subordinate and instrumental status of the material principles of things. This will take the form of an individual treatment of each of the causes of natural things - material, formal, efficient and final - and of the kind of necessity truly characteristic of nature's works. It is here that we turn to the second position concerning the role of the material principles in nature. With our discussion of the necessity proper to nature, we terminate the first part of this work.

In the second part, we shall present a study of the instances in nature which actually manifest a supremacy of the matter, though one necessarily limited in scope. This section will deal with natural phenomena which arise <u>ex necessitate</u> in the proper meaning of this expression. There we shall learn that, although the materialistic conception of the principles of natural things is false, the role of the purely physical factor in nature is not always a subordinate one. But interestingly enough, we shall also learn that the materialist cannot, in consistency, speak of an event as occuring in accordance with a necessity from the matter. For events of this nature involve a more intimate relation to the final cause than is possible when this cause is simply and universally negated. This truth is implied when

it is said that "necessity from the matter" refers to the material principles as departing from their ordination to the end.

CHAPTER ONE

CAUSE AND NECESSITY

The problems to be considered in this work are so essentially related to the notions of cause and necessity, that we must present an exposition of the latter before we treat of the particular subject we have chosen for this dissertation. The first of these to be treated will be that of cause. Having defined causality in general, we will then consider the various kinds of causes. We will follow the same order with regard to necessity. Finally we shall point out in a more particular manner how the notion of necessity concerns one of the main purposes of this paper, namely, to determine the relation between the material principles and the end of natural generation.

1. CAUSE

Everyone seems to agree on the general notion of cause - even when causality is denied - for it is plainly assumed in every inquiry. This is indeed most obvious in the case of artifacts. Thus in answer, say, to the question "why a saw?", we would name a cause, i.e. something upon which it depends, such as its purpose, its shape, what it is made of, and how. As we see from this enumeration, the cause is always, in some respect, something other than that about which we ask the question. For instance, when we say that the saw is

made of steel, or of some other metal or alloy of metals, the saw is identical with its metal, but not in every respect, for it is metal with a certain shape. Nor, in turn, is the saw wholly identical with its shape, for it is not this shape alone. And, of course, the saw is clearly other than its maker and its purpose. A cause, then, is that upon which something else depends in order to be, or to be what it is; that upon which something else is consequent; that from which something else is derived.

These related notions of the common nature of cause are set forth by St. Thomas in various texts. In the Physics, he draws attention to the dependence of the caused upon its cause, writing:

> those things are called causes upon which things depend either for existence or becoming. (1)

In another text taken from the Physics, we find the aspect of consequence:

> a cause is that from whose existence the existence of another follows. (2)

The note of derivation is emphasized in a passage found in the Metaphysics, where St. Thomas speaks of an influx of being coming from the cause. There, too, he distinguishes cause from principle, for principle involves only an order from one thing to another, and does not, as such, connote this influx of being that is essential to cause.

> Although principle and cause are the same in subject, they differ in their very nature. For the term 'principle' implies a certain order, while the term 'cause' imports a certain influx into the being of the caused. (3)

Thus we have what it is to be a cause. However, as John of St. Thomas notes in his Cursus philosophicus, none of these notions, taken by itself, completely and adequately reveals the nature of cause. For this reason, he gathers together these separate points and lays down a definition of cause which includes each of them. He writes:

> A cause is a principle of something by way of influx or derivation, from which something naturally follows in accordance with a dependence in being. (4)

When, in turn, we seek to know those principles upon which the being of another depends, no single kind of thing is encountered; for, as was suggested in the example we have given, the word cause has several meanings. While the common notions of dependence and derivation apply, in every instance, to a greater or lesser degree, the precise way in which something is dependent upon or derived from another varies. This is but to say that there may be more than one cause of a thing. We find this revealed in the variety of questions which seek the reasons for the existence of something. Concerning any artifact, for example, we may ask "What is it made of?". In reply to this question we name what is called the material cause - that upon which the artifact depends

as its matter. This cause is defined by St. Thomas as follows:

> In one way, 'that from which something comes when it is in that thing' is called a cause, as bronze is called the cause of the statue and silver the cause of the drinking vessel. (5)

The defining property of the material cause is that it exists 'in" the thing. Under this species of cause, therefore, falls not only the immediate subject of the form - the silver of the drinking vessel is an example of this - but also the elements of a thing and, more generally, any parts of the whole. (6)

Another question we might ask concerning the existence of a thing is the simple "what is it?". Here we seek the reason why the thing is what it is, or, to use the technical term, we seek the "essence" of the thing, or that "by reason of which" it is "what" it is.

> In the second way the 'species or exemplar' is called a cause, and this is called a cause insofar as it is the reason why the thing is what it is, for this is that through which we know what the thing is. (7)

Related to the question "What is it?" is "that" which directs attention to that element in the thing other than its matter. For example, we would seek to know what it is that, besides the silver, makes this thing a drinking vessel. This we call its form, or its formal cause. And, as is clear from the example of the artifact, it is also that "by reason of which" the thing is what it is. Unlike the essence, however, it is necessarily considered apart from the material

cause of the thing. (8)

Pursuing our inquiry into the reasons for the existence of a thing, we would encounter that cause referred to in the question "What or who made it?".

> In another way, 'that by which there is a principle of motion or rest' is called a cause; for example, one giving counsel is called a cause, the father is a cause of the son, and everything that produces a change is the cause of that which is changed. (9)

This is the principle or source of the motion involved in the coming-to-be of a thing, which terminates in the union of the matter with the form. We call it the efficient or agent cause. In the example of the drinking vessel, the cause to which we refer would be the craftsman. For it is this agent who, acting in a determinate fashion owing to his possession of art, forms the silver into a vessel.

Directly consequent upon knowledge of the agent cause is that question which seeks the cause of the productive action itself. This inquiry is directed toward the intention of the one who acts.

> As the fourth mode of cause something is called a cause as the end. This is that for the sake of which something comes to be, as health is said to be the end of walking. This is clear because when we ask, 'For what reason does he walk?', the answer is, 'In order that he might become healthy.' (10)

This we term the final cause. Its effect, or that of which

it is the proper and immediate cause, is the very action of the agent. In the example we have had recourse to thus far, the cause in question would be the form of the drinking vessel. For the craftsman acts in order to produce the form in the silver. The form, in turn, is for the sake of the use to which the drinking vessel is put. Thus it is this end which is the ultimate reason for the action of the agent.

The end, as we see, is the cause of the action of the agent. As such, it is the cause of the causality of the agent, for the agent causes in acting. (11) By that fact, too, the end is the cause of the causality of the remaining causes, the matter and the form. This is pointed out by St. Thomas in the Metaphysics:

> Although the end is ultimate in being in certain things, it is always prior in causality. Whence it is called the cause of causes, because it is the cause of the causality of all the causes. For it is the cause of the causality of the agent, as was noted above. The agent, however, is the cause of the causality of the matter and the form. For, through its motion, it renders the matter susceptible to the form, and the form to be in the matter. Consequently, the end is also the cause of thecausality of the matter and the form. (12)

A particular problem attaches to the final cause. Because the end is ultimate in being, as was noted in the above text, it is less evidently a cause and seems, rather, to partake of the nature of an effect simply. For this reason, we must ascertain the precise way in which it is a cause. With regard to this, we have but to call

attention to the fact that the end is a cause as the good. Thus Aristotle writes:

> The remainder are causes as the 'end" and the good of the other things; for that for the sake of which other things are tends to be the best and the end of the other things; let us take it as making no difference whether we call it good or apparent good. (13)

In other words, the end causes inasmuch as it is the object of desire, i.e., because it is a good. "As the agent causes in acting, so the end causes in being wanted and desired", writes St. Thomas in De Veritate. (14) It is, for instance, because we love health that we engage in the activities that lead to it; it is because we desire it that we seek to realize any end. It is as though the end moved and thus determined our will toward itself. Of course, this "motion" of the end is only metaphorically such, since it is properly but an attraction. (15) Still, in so describing the causality of the end, its nature is more easily grasped, and any doubt concerning its reality is more easily dispelled.

2. NECESSITY

Those things are said to be necessary "which cannot be other than they are." (16) The necessary, then, is "that which must be" (17) or "that which cannot not be." (18) Necessity, on the other hand, is the absolute determination imposed upon or found in things in accordance

with which they must be, or must be such, or must undergo such. As Aristotle writes in the Metaphysics: "necessity is that because of which a thing cannot be otherwise." (19)

The principles or causes of necessity are as many as the causes of things. Any one of the four causes may necessitate something else - though the mode of necessity will differ in each case. The way in which each of the causes may be a source of necessity is shown by St. Thomas in his commentary on Book II of the Physics. The question there considered is that of the kind of necessity found in the generation of natural things. As we have already suggested, an exposition of this text brings us face to face with one of the principal problems of this paper.

Aristotle poses the question as follows: "As regards what is 'of necessity' we must ask whether the necessity is 'hypothetical' or absolute as well." (20) In order to understand this distinction and its bearing upon the question,

> we must note that the necessity which depends upon prior causes is an absolute necessity, as is evident from the necessity which depends upon the matter. For the corruptibility of an animal is an absolute necessity, since to be composed of contraries follows from the fact that it is an animal. (21)

The particular example of necessity from the matter offered by St. Thomas will be studied in detail in a later chapter; we will also, in the present chapter, set forth a general picture of this kind

of necessity. For our immediate purpose, therefore, we need simply note that it is the nature of its material principles which entails, with an absolute necessity, the corruptibility of the animal.

Two other causes may be sources of absolute necessity. These are the agent and the form:

> Similarly, that which has necessity from the formal cause is absolutely necessary; for example, that man is rational, or that the triangle has three angles equal to two right angles, which is reduced to the definition of the triangle. And in the same way, that which has necessity from the efficient cause is absolutely necessary; for example, because of the motion of the sun it is necessary that night and day alternate. (22)

The necessity from each of the causes thus far mentioned - the material, formal and efficient - is termed absolute or a priori because the source is prior to that which is necessitated. Opposed to such absolute necessity is that which has its origin in the fourth cause, the end. Unlike the above three causes, the end is posterior in existence. Therefore, the necessity from the end is hypothetical or conditional:

> But that which has necessity from that which is posterior in existence is necessary on condition or supposition; for example, if we were to say that this is necessary if that is going to take place. This latter necessity is from the end and from the form insofar as it is the end of generation.(23)

Concrete examples of this kind of necessity are presented

by Aristotle in the Metaphysics. (24) One such instance concerns food: this is necessary if man or any animal is to continue in existence. Another relates to taking medicine: this is necessary if the sickly individual is to recover his health. Still another concerns the voyage which the creditor may have to make in order to obtain the money due him. As is apparent from these examples, the necessity from the end is not absolute, but conditional. In each case cited, those things prior to the desired end are conditions of its existence; they are necessary "if" the end is to be.

As we have seen, St. Thomas is considering the question of necessity in direct relation to natural generation. But before he determines the kind of necessity actually found in the coming-to-be of natural things, he limits the possibilities to necessity from the matter and necessity from the end:

> Therefore to ask whether, in natural things, the necessity is an absolute one, or from supposition, is the same as to ask whether necessity in natural things comes from the end or from the matter. (25)

In order to understand why the alternatives are these and no others, we must first analyze the causes excluded from further consideration - the form and the agent. As regards the formal cause, there is no difficulty. The form of natural things, though, in a sense, a prior cause (it is the cause of the rationality of man, for example), is, in generation, posterior in existence. For it is

the term of generation, as St. Thomas stated in a text quoted above. Accordingly, it cannot be a source of absolute necessity in the generation of natural things, with which we are here concerned. Rather, as was also noted by St. Thomas, in generation necessity from the form is identical with necessity from the end, and this is always a conditional necessity.

However, the immediate exclusion of the agent cause as one of the sources of necessity in natural generation does present an apparent difficulty. For the agent is prior in existence to the natural thing, and therefore a possible cause of an absolute necessity in its generation. But here, too, we can detect St. Thomas' reasoning in restricting the alternatives to the matter and the end. First of all, he is here assuming that the agent in natural generation acts for an end; and wherever there is such action the necessity is from the end. Thus, even assuming a necessity from the agent cause, upon an ultimate consideration the necessity would yet be conditional. The reason for this is that the causality of the agent is itself caused by the end. As a consequence, the effects of the agent are always conditional upon its seeking to realize a given end - that is to say, the effects must be only "if" the end is to be. The second, and more important, reason for the exclusion of the agent is that this cause of the generation of natural things does not, in fact, produce its effects of necessity. This, too, St. Thomas assumes in his treatment

of necessity in nature, since, in the prior chapters of this Book of the Physics, much discussion was devoted to the question of contingency in the coming-to-be of natural things. And so, when discussing the problem of necessity in nature, he does not consider the possibility of a necessity deriving from a cause previously established as open to contingency.

Now inasmuch as the agent cause is excluded for such reasons, it is apparent that any possible absolute necessity in nature must satisfy two conditions. First of all, it must be incompatible with action for an end; otherwise, ultimately, the necessity would be from the end - which is to say that it would be conditional. Secondly, it must be compatible with contingency; for, as was noted above, natural things do not come to be with an a priori necessity. Both of these conditions are realized in necessity which comes from the matter. For to hold that something occurs by a "necessity from the matter" is to hold that the end of a natural process is the pure result of the material conditions given in act. In affirming that the end is a "pure result", we are negating its causality, and, by that fact, excluding the conditional necessity which derives from the end. And in stipulating that the material conditions be "given in act", we are allowing for the above-mentioned union of contingency with necessity; for, while the material conditions may not themselves be necessary, once they obtain, that of

which they are the cause must come about. Accordingly, St. Thomas considers as one possibility (in opposition to a necessity from the end) that the existence and characteristics of natural things are simply the necessary product of their material principles.

In order to manifest the nature of necessity from the matter, we must have recourse to some concrete illustrations. There are two very apt ones to be found in De Partibus Animalium. In the 4th Book of that work, Aristotle writes of a peculiar characteristic of serpents - the ability to turn their head backwards without moving the whole of their body. "The reason for this", he writes, "is that a serpent, like an insect, has a body that admits of being curled up, its vertebrae being cartilaginous and easily bent." He then adds: "The faculty in question belongs to serpents simply as a necessary result of this character of their vertebrae; but at the same time it has a final cause, for it enables them to guard against attacks from behind." (26) Now, let us abstract from the fact that this faculty of serpents is intended, and that its truly first cause is the function to which it lends itself. This done, it is evident that we must view the faculty as being "merely" a necessary product of the serpent's given physical structure. Let us now consider the aspect of necessity found in this phenomenon. It is true, certainly, that the physical structure necessitating the faculty in question may not itself be necessary (indeed, the serpent may not be necessary), but it is also true that, positing it, this peculiarity must be.

The above example was one of a thing wholly given, in which the aspect of necessity is quite apparent. However, necessity from the matter may also be found in the coming-to-be of a thing, where the aspect of contingency is equally pronounced. In this connection, in the same Book of De Partibus Animalium, Aristotle cites the case of the talons of birds, and notes the properties which derive from them. He writes:

> All this is the necessary consequence of the process of development. For the earthy matter in the body issuing from it is converted into parts that are useful for weapons. That which flows upwards gives hardness or size to the beak; and, should any flow downwards, it either forms spurs upon the legs or gives size and strength to the claws upon the feet.(27)

Here, too, let us abstract from the fact that the phenomenon being considered has a final cause - the animal's possession of useful weapons. Having done so, we must hold that the end actually achieved is "merely" the necessary term of a specified material process. - Let us now turn to the aspect of necessity found in this developmental process. Beyond question, the process leading to possession of the talons is not pre-determined: it could easily be impeded by any number of factors. However, assuming the process to be unimpeded, it is evident that a given term (the talons) must ensue for the nature of the material cause involved necessitates this. Such is Aristotle's meaning when he states that "All this is the necessary consequence of the process of development." And thus, under the conditions assumed, we can properly

speak of a necessity - and of an absolute necessity, since its cause is prior in existence - in the coming-to-be of a natural part.

The above illustrations dealt only with the development of certain natural parts and characteristics, and not with the generation of a natural substance as such. However, so far as the notion itself is concerned, the extension of necessity from the matter to the generation of the natural being as a whole presents no difficulty. For it would be entirely possible to consider the natural whole as simply and merely a necessary product of the material principles which compose it. This, of course, is the materialist position on the generation of natural things, in which all but the causality of the matter is denied.

As has been noted throughout the present discussion, the assertion that something comes to be by a necessity from the matter must be based upon the negation of the final cause. Nevertheless, to see the validity of such an interpretation we need only direct our attention once more to the necessity found wherever there is action for an end. If it be accepted that the talons of the bird, say, are ordered to an end, in reply to the question, "why must they be?", we would have to state, "because of the end which they serve". Such a reply simply acknowledges the absolute priority of the end as a cause. And as regards the material cause of the talons, the true explanation would then be that it was simply utilized by nature

in the production of a desired part. If, on the other hand, we were to attribute the talons' existence merely to the matter, we would be falsifying the circumstances which actually obtain. For, by implication at least, we would be denying that the ultimate ground of their existence, and thus of their necessity, was the end for the sake of which they come to be. Consequently, only if there be no final cause can we legitimately hold to a necessity from the matter.

But further exposition of this point must be postponed until a later chapter, in which we will analyze at some length the necessity proper to nature. What we must grasp at this juncture is that necessity from the end is entailed by final causality, and, in turn, that necessity from the matter follows from the negation of the final cause.

CHAPTER TWO

MATERIALISM

The name "materialism" is ambiguous. Usually it refers to a philosophy which explicitly denies non-material reality. Thus understood, it could not be applied to any of the Greek philosophers. In this work, however, the term is also employed to designate a view of nature held by the ancient naturalists. The reason for this is simple. Although, unlike many moderns, the ancients did not deny the existence of spiritual reality (either because it was not the subject of consideration, or because, as in the case of Anaxagoras, its necessity was acknowledged), they did seek to explain nature in terms of material causality alone. Since we are here concerned only with the generalization of this type of causality, the ultimate difference between the moderns and the ancients is not of great importance.

The cardinal tenet of materialism is that the material cause of natural things is sufficient to account for their existence, structure and behavior. This cause is either some fundamental "stuff" or the elements that compose things. The position in question means the reduction of natural things to their matter, and thus allows us to consider them as no more than accidental wholes. They are to be

compared with artificial things, such as a machine. In fact, it is the material components of the machine that exist in the full sense of this term. In the same way, the materialist maintains that the ultimate constituents of natural things alone possess absolute or substantial existence.

In the Metaphysics, Aristotle writes of this basic thesis of materialism:

> Of the first philosophers, most thought the principles which were of the nature of matter were the only principles of things. That of which all things that are consist, the first from which they come to be, the last into which they are resolved (the substance remaining but changing in its modifications), this they say is the element and this the principle of all things...(1)

The nature of the material principle varied with most of the ancients. Thales, whom Aristotle calls the "founder of this type of philosophy", asserted that water was the first and sole principle of all things. Others believed in the primacy of air. Empedocles believed in the dominance of four elements in all, water, fire, earth and air. Anaxagoras held that the ultimate principles of things were infinite in number, as did Democritus, though the latter's principles differed in kind from those posited by Anaxagoras.

But whatever the nature or number of the material principles, in all cases they were considered to be the sole cause of things.(2)

The immediate grounds for this common belief are to be found

in those characteristics of the material principles which are listed by Aristotle when he defines this position. First, all things were held to contain, or consist of, the elements. From this followed the second characteristic of the matter: it is that from which things come to be. Finally, corruption involved resolution into the elements. As a consequence, the matter was held to endure throughout all transmutations, and to remain identical in substance while composing different things. In other words, matter was viewed as the very substance of things. (3)

In this position, all becoming is no more than an extrinsic modification of a self-same matter. For, as an enduring substance, matter allows only the reception and loss of accidental forms or arrangements. On this point, Aristotle writes:

> ...and therefore they think that nothing is either generated or corrupted, since this sort of entity is always conserved, as we say Socrates neither comes to be absolutely when he comes to be good or musical, nor cease to be when he loses these characteristics, because the substratum, Socrates himself, remains, just so they say nothing else comes to be or ceases to be; for there must be some entity - either one or more than one - from which all other things come to be, it being conserved. (4)

The reasoning of the ancients about nature rested on an analogy with the becoming and existence of artificial things. This is shown by Aristotle in Book II of the Physics. There he writes:

> Some identify the nature or substance of a natural object with that immediate constituent of it which taken by itself is without arrangement, e.g., the wood is the 'nature' of the bed, and the bronze is the nature of the statue. (5)

The argument in favor of this position is that if the wood of the bed were planted, and something grew from it, this would be wood, and not another bed:

> As an indication of this Antiphon pointed out that if you planted a bed and the rotting wood acquired the power of sending up a shoot, it would not be a bed that would come up, but 'wood' - which shows that the arrangement in accordance with the rules of art is merely an accidental attribute, whereas the real nature is the other, which, further, persists continually through the process of making. (6)

The principle thus affirmed - that what persists throughout all change is the "nature" of a thing - is then applied to natural things:

> But if the material of each of these objects has itself the same relation to something else, say bronze (or gold) to water, bones (or wood) to earth and so on, 'that' they say would be their nature. Consequently some assert earth, others fire or air or some all of these, to be the nature of things that are. For whatever any one of them supposed to have this character - whether one thing or more than one thing - this or these he declared to be the whole of substance, all else being its affections, states or dispositions. Every such thing they held to be eternal (for it could not pass into anything else), but

other things come into being and cease to be time without end. (7)

Related to this denial of the becoming of substance and to the denial of a substantial formal principle, was a dialectical argument based on the principle "ex nihilo nihil fit". In opposition to the contention that something, originally non-existent, comes to be, the ancients demanded to know that from which it comes to be. If that from which it comes to be was viewed as itself non-existent, they held that this assertion involved a contradiction. For nothing comes from nothing - that is to say, the matter, or substance, of a thing, which is that from which it comes to be, cannot be a non-entity. If, on the other hand, that from which a thing comes to be was viewed as previously existing, the generation affirmed was held to involve another contradiction. For it is equally impossible that being should come from being, since the very substance, the matter, of that whose coming-to-be is affirmed already existed. Therefore, they concluded, all change is necessarily restricted to modifications of the substances given in act. (8)

Now, although the ancients limited all becoming to changes in the disposition of matter, even change of this nature demanded a cause other than that composing things. This truth was recognized by some of the first philosophers, although their responses to the

problem varied. Thus, after noting the scients' reduction of natural existence to the material principle, Aristotle writes:

> From those facts one might think that the only cause is the so-called material cause; but as men advanced the very facts opened the way for them and joined in forcing them to investigate the subject. However true it may be that all generation and corruption proceed from some one or (for that matter) from more elements, why does this happen and what is the cause? For at least the substratum itself does not make itself change; e.g.neither the wood nor the bronze causes the change of either of them, nor does the wood manufacture a bed and the bronze a statue, but something else is the cause of the change. And to seek this is to seek the second cause - that from which comes the beginning of change (9).

However, among the ancients there were the monists, who, on principle, denied the reality of change, and so they had no recourse at all to the moving cause. The exception within this group of philosophers was Parmenides. Though he denied the reality of change as to "reason", he did grant its existence in the realm of sense (10). In this one order, therefore, a cause beyond the material was assumed.

Then there came those who posited an active cause in the real order, neither denying it nor restricting it to the realm of sense. These were the pluralists, whose ultimate principles were many, and which thus permitted the necessary division into the active and passive (material) causes.

> But for those who make more elements it is more possible to state the second cause, e.g. for those who make hot and cold, or fire and earth, the elements; for they treat fire as having a nature which fits it to move things, and water and earth and such things they treat in a contrary way (11).

In addition to those who thus accounted for motion we find Democritus and Leucippus. While denying a distinction between the active and material causes, they did posit a per se mobility in their elements. (12) Further, two of the pluralists, Anaxagoras and Empedocles, went beyond the elementa in this order of cause, and sought an agent of a higher and more universal nature. Anaxagoras, taking cognizance of the order in nature, believed in a Nous, or intellect, as the principle of this order. And Empedocles affirmed the existence of two universal active principles, love and strife, whose functions were alternately to unite and then to segregate the elements composing the whole of nature (13). But, as Aristotle notes, "Anaxagoras uses reason as a deus ex machina for the making of the world, and when he is at a loss to tell from what cause something necessarily is, he drags reason in, but in all other cases ascribes events to anything rather than to reason" (14). Empedocles, in turn, was guilty of gross inconsistencies in his use of love and strife, which indicated the factitious character of these principles (15). And, like Anaxagoras, he did not resort to these causes sufficiently, but usually reduced all effects in nature to the agency of one or more of the material elements. Therefore we can rightly consider these

universal principles as extrinsic to the systems under study, and limit ourselves to illustrating the method actually employed in accounting for the coming-to-be of natural things.

One instance of this reduction of all efficient causality to the elements is offered by St. Thomas in his Commentary on the De Anima. The question under discussion concerns the functioning and effects of the vegetative soul. In treating of this question, St. Thomas calls attention to the contrary opinion of Empedocles. Consistent with his general position, Empedocles attributes growth, whose actual principle is the vegetative soul, to the action of matter. Thus, in the case of things which grow upwards, the principle is said to be fire; it has a natural tendency to move in that direction. The growth of plants, which is downwards, is attributed to the natural motion of earth, which is held to be their principal component (16).

A general statement of the ancients' position on the active causes of becoming, joined to some very concrete illustrations, is found in the introduction on method in De Partibus Animalium. There Aristotle writes:

> Now that with which the ancient writers, who first philosophised about nature, busied themselves was the material principle and the material cause. They inquired what this is, and what its character; how the universe is generated out of it, and by what motor influence, whether, for instance, by strife or love, whether by intelligence or spontaneous action, the substratum of matter being assumed

> to have certain inseparable properties; fire, for example, to have a hot nature, earth a cold one; the former to be light, the latter heavy. For even the genesis of the universe is thus explained by them. After a like fashion do they deal also with the development of plants and of animals. They say, for instance, that the water contained in the body causes by its currents the formation of the stomach and the other receptacles of food or of excretion; and that the breath by its passage breaks open the outlets of the nostrils; air and water being the materials of which bodies are made; for all represent nature as composed of such or similar substances. (17)

Thus the generation and development of all things were traced back to the interaction of their ultimate material constituents. As Aristotle suggests here, the assertion is entirely a priori in character. Since the elements alone truly are, it follows that all causality, whether intrinsic or extrinsic, passive or active, must be attributed to them.

We come now to the final assertion of the ancients materialists on the causes of natural things. This concerns the role played by the end of natural processes. Intimately related to this question is that of the necessity found in the generation of natural things. We find their positions on both subjects treated jointly by St. Thomas in Book II of the Physics. The immediate consideration is of the necessity in nature. The question is: "Whether the necessity of natural things is always from the matter,

or sometimes from the matter and the agent, or sometimes from the form and the end." (18) We are led to seek a precise determination of this point because:

> All the ancients reduced natural effects to this (the material) cause in giving the reason for them, namely, that it is necessary that they happen so because of the matter; for example, because that which is hot is naturally such and produces such an effect, and similarly that which is cold, and all like things, it is necessary that those things which are caused by these come to be or exist (19).

The ancients viewed this posited relation between the prior material causes and their effects as rendering needless the recourse to an intention in the operations of nature. An instance of what appeared to be an evident adequacy of the material agents to account for natural phenomena is found in the case of rain. Here, so it would seem, the purely physical factors are the sole causes; at the very least, positing them in act, rain must follow. On the basis of the experimental science of the day, St. Thomas shows how the phenomenon ofrain would be thus rationalized:

> For example,it would be said that 'Jupiter pours out rain', i.e. God or universal nature, not for the sake of growing grain, but, rather, from the necessity of the matter. For, when the lower parts of earth were heated by the proximity of the sun, necessarily vapors were produced from the matter; then, when these vapors, rising because of the heat, arrive at the place where the heat fails because of its distance from the rays of the sun, it is necessary that the water, rising as vapor,

> be condensed and thus changed back into water; and when water is thus produced, it is necessary that it fall downwards because of gravity (20).

In the light of this rational sequence of events, there is apparently no reason why the term or end should be considered a causal factor. Indeed, the very possibility of considering the end as a cause would seem to be precluded by the manifest indifference shown by nature in regard to goals actually achieved. We see this indifference in the same phenomenon of rain. Thus:

> when it rain grain grows. But not in order that this might occur, since in certain regions the grain is destroyed by rain; for example, when the rain floods a field; not, of course, so that the grain might be destroyed, but as a chance effect of the rains falling. Therefore, it would also seem to be by chance that the grain happened to grow as a result of the rain (21).

Once the neutrality of nature is established in an example such as rain, there would seem to be no reason why the principle that events occur solely from the necessity of matter should not be extended to all of nature. This mode of explanation would even appear to be applicable to the development of the organs of animals. For most certainly physical factors are operative there, and should thus be accounted the true causes, whatever the appearances of intention in such cases.

> Whence it would appear that nothing prevents this being true for the parts of animals, which do seem to be so disposed for some end.

> For example, one might say that the sharpness of the front teeth, with their resultant aptness for cutting food, and the width of the molars, with their aptitude for grinding, came from the necessity of matter. Nature did not make these teeth for such utilities; rather, when the teeth, made by nature because of the necessity of matter, came along, it happened that they followed that form, and when that form existed, the utility in question also followed. And the same thing can be said of all the other parts that seem to have a determined form for some end (22).

Of course, the frequency with which favorable organic characteristics occur among living beings does offer an obstacle to this theory. For it would not seem possible to attribute all merely to a union of chance and necessity from the matter when a determination of this constancy is found in nature. However:

> in order to exclude this objection, they say that in the beginning of the world the elements joined together to form natural things and many and varied dispositions were produced. Among these, all that chanced to have some utility, much as if they produced for this reason, were preserved by the fact that they possessed a disposition apt for survival. But this was not given them by an agent intending an end, but by that which is intrinsically vain, i.e. by chance. On the other hand, those which did not possess such a disposition were destroyed, and are daily being destroyed. For example, Empedocles said that initially certain beings were generated which were part man and part ox (23).

One manifest instance of nature's so-called "intention" having been accounted for, the validity of the ancients' thesis

would appear to be established. The principle is always the same: if physical factors can ostensibly explain natural events, dependence upon another cause to explain these same events is superfluous. As well, the attribution of intention to nature is held to involve its own particular difficulties. For the failures of nature, its useless productions and its monsters, indicate that the affirmed purposiveness in nature is human in origin. On the other hand, the purely physical must always be operative in the works of nature; and its established neutrality and indifference as regards the effects actually produced explains in rational fashion the mixture of good and evil observed. In view of the blindness with which the material elements must proceed, such a mixture of good and evil, of success and failure, is to be expected.

Aside from different theories as to the nature of the elemental bodies or energy forms, and consequently of the basic laws governing the material universe, modern materialism differs but slightly from that of the ancients. The matter of things is viewed as the sole substantial principle of their existence. It is accepted as wholly adequate to account for the development of all the modes of natural existence. The causality of the material elements in the operations of nature is considered to be evidence that there is no final cause of these operations. And from this it is concluded that all realized ends are the product of necessity. The one point of difference is

that many of the moderns make no clear distinction between the material and efficient causes. As a rule, they are merged under the term "law", all of nature being considered as one vast process, with isolated areas of relative concertion and independence arising out of the flux. (24) But this variation in theme is, in the present context, of slight import. Like the ancients, the contemporary proponents of materialism see nature as limited in reality to its material content. This is the case whether it be considered as one fundamental "stuff" along with its modifications, or as, in the works of one author, a "universe of organization within organization which hangs like a tension in space-time sloping at either end to the unknown limits of nothing and of all" (25). All else is shunted aside as delusion, as "but a name given them by man".

In his Human Knowledge - Its Scope and Limits, Bertrand Russell presents his version of the initial thesis of materialism to the effect that the matter of things is the only intrinsic principle of their existence. Here the emphasis is upon the laws that govern matter and upon their posited extension to living beings. It is not merely a question of whether living beings obey the laws of physics, but whether, in addition, the laws of living matter are identical to the laws of inanimate matter. Russell writes:

> There is no reason, except the greater complexity of the molecules that compose a living body, why such molecules should not be manufactured artificially; nor is there the slightest reason for sup-

> posing that if they were manufactured they would lack anything distinctive of living matter naturally generated. Aristotle thought that there was a vegetative soul in every plant or animal, and something similar has been widely believed by vitalists. But for this view there has come to be less and less plausibility as organic chemistry has progressed. The evidence, though not conclusive, tends to show that everything distinctive of living matter can be reduced to chemistry, and therefore ultimately to physics. The fundamental laws governing living matter are, in all likelihood, the same that govern the behavior of the hydrogen atoms, namely the laws of quantum mechanics (26).

Russell's belief that the artificial manufacture of living matter would disprove the existence of a substantial formal principle, in this case the soul, and thus of a principle of existence and of action beyond matter, establishes his fundamental kinship with the ancient naturalists. The undoubted fact that matter enters into the generation of living things leads him to assert that this one cause renders unnecessary the recognition of another cause. This is identical to the belief that "id ex quo fit aliquid" is the only principle and cause of that thing.

An exceedingly articulate exposition of this monistic doctrine is presented by R.W. Sellers in an article in the Philosophical Review, entitled"Reformed Materialism". The qualification "Reformed" is added to distinguish it from one form of ancient materialism (Democritus is probably meant) in which "changes were thought of as not involving the atoms themselves and reducible to mere shifts in position" (27). This theory Sellers rejects, and offers the following in its stead:

> In some way these (electrons, neutrons, etc.) are integrated to form the nucleus of atoms. They are in the nucleus as the eggs are in the omelette. Some kind of dynamic organization has taken place which must not be pictorialized in billiard-ball terms (28).

The affirmation of such a "dynamic organization" does not mean that some new substance comes to be. For the position is: "we must, I take it, postulate primary endurants which form what I call secondary endurants" (29). This distinction between primary and secondary "endurants" has its counterpart in a distinction between "being" and "existence". (30) On this point, the author writes: "As I see it, generation applies to the composite and integrated and presupposes the intrinsic endurance of the stuff which is integrated" (31). And again: "By its very logic materialism must harmonize the intrinsic endurance of its ultimate stuff with the generation and corruption of composite wholes; and the facts indicate that integrative causality gives rise to the emergence of novel levels of existence within 'being' " (32). The emergence of new forms of "existence" is attributed to the "primary endurants" themselves, for: "Matter I take to be active, dynamic, relational and self-organizing" (33). The attribution to the matter of all causality in becoming takes the form of the assertion that the "higher rises from the lower". Thus: "The hylomorphism of materialism, as we have noted, makes the united and organized wholeness of an existent the expression of integrative causality so that the higher rises from the lower" (34). With

this last affirmation, Sellers joins the ancients on another point of importance: the reduction of all agency in natural generation to the material elements. And as was pointed out in the case of the ancients, this is simply a necessary consequence of the reduction of "being" to these elements.

Another very direct statement of the principles of materialism is found in an article by one H. Heath Bawden, entitled "The Psychical as a Biological Directive". Its stated purpose is to rebuke a tendency the author has noted in the works of the eminent biologist R.S. Lillie. For, inopposition to the tenor of the day, Lillie gives credence to the position that living things manifest both a factor (the soul) beyond the matter and directive ness in their generation and continuance in existence. To strengthen such frailness of the "scientific" spirit, Bawden presents this counter-directive:

> One living cell divided into two or united with another cell, and the race began. Certain protein organizations developed chromosomes, genes, enzymes, hormones, and even manufactured vitamins in the digestive tract. In a world of spontaneous variations and random reactions anything could happen and we are an example of what did happen. Thereis noscientific evidence that what happendd was the result of premeditated design. Adaptation ofmeans to ends took place in the same fortuitous way that a spinning proton will enter the nucleus of an atom, turning it into an isotope, or a spinning neutron will throw off a revolving electron, thus altering its electrodynamic status. Stable genes gave continuity to genera and species.

> Unstable ones were responsible for the mutations, sports, variations, of evolution... The so-called laws of chance account for the facts of nature up to the point where human nature steps in to intentionally redirect its forces... The alleged teleological adaptation of means to ends in sub-human nature is a result of the operation of the principles of random distribution which, among the infinity of the variations of nature's forces does at times achieve what we regard as relevent results. (35)

Thus is affirmed, with an unqualified assurance, the necessary adequacy of the material factors to account for all the complex forms of life developed in nature. No other agent cause is considered; by implication, a substantial formal principle is denied; and the possibility of a "premeditated design" is dismissed in favor of the "principles of random distribution".

Another explicit negation of the final cause is presented by F.J.E. Woodbridge in his book "Nature and Mind". There he offers a view of the relation between the matter and the end in the works of nature that is in admitted agreement with one of the ancients, Democritus. Woodbridge writes:

> Long ago Democritus noted that the orderly arrangement of the sand, the pebbles, and the stones upon a beach was not due to any designed selections, but was the necessary result of the coincidences of those things and the actions of the waves. So, too,

> while the arrangement of plants in a garden may show the gardener's taste and skill, the distribution of vegetation about the shores of a lake, although no less remarkable in its arrangement, needs no gardener for its explanation; for, again, the fact that the water and the soil have happened to meet there under certain natural conditions excludes any other explanation of the resulting order. And it has not been difficult to extend a similar explanation to the marvelous structure and functions of animals. Its apparent incredibility steadily diminishes with greater familiarity with the facts and with increased experimentation, until it becomes no longer easy - it may, indeed, become impossible - to think of nature as a work of art. Its uses and adaptations appear rather to be accidental, because they simply befall under the conditions which happened to exist in any given case. They appear also to be necessary, because given these conditions, no other results than the actual appear to have been possible. (36)

A different approach toward the question of purpose in the operations of nature is found in a work by A.C. Ramsperger. Unlike Woodbridge, he does not see the joint causality of the end and the matter as somehow contradictory; indeed, he openly acknowledges that the natural activities of living beings seem to suggest a determination from the end. However, he is led to deny the possibility of imputing purposeful action to nature for another reason. The argument that he employs is based on the undisputed fact that the natural agent lacks knowledge of the end. This one fact, he holds, renders "unintelligible" the assertion that the operations of natural things are caused by the ends to which they lead.

> All living things, including plants, exhibit behavior which serves the purpose of self-preservation. This lends plausibility to the view that the activities of living things are directed by the ends which the activities achieve. But when we inquire how the future ends can direct present activities, we find that this is completely unintelligible, unless we are willing to suppose that moths and vegetables are motivated by the ideas of anticipated goals. For this there is no good evidence. Nor is anything gained by saying that plants and the lower animals are motivated by unconscious purposes. Behavior is explained by purposes only on the supposition that it is conditioned by actual thoughts or images of the expected outcome, that exist at the time of the behavior. (37)

As is readily seen, this argument is sound only if action for an end demands, by its very nature, knowledge of the end on the part of the one acting. Only if this is the case, is one free to characterize as "unintelligible" purposeful action that does not follow upon such knowledge. However, further discussion of this point must be reserved for the chapter in which we will treat of the validity of the entire materialist position on finality in nature. At this point, the order which we have established demands that immediate consideration be given to the basic assertion of the materialists - that relating to the intrinsic principles of natural things.