

FINALITY IN NATURE IN ARISTOTLE'S
PHYSICS II, CHAPTER 8

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The second book of Aristotle's *Physics* is a general account of the method of natural science. This involves the consideration of two questions: what is the subject of this science, and by what causes does it demonstrate? After determining the subject of the science, in the first two chapters, Aristotle proceeds to determine the kinds and modes of cause in nature in the remainder of the book.

An adequate general consideration of the causes requires a discussion of *luck* and *chance*. For since we all speak of certain things coming about *by* luck or chance, one naturally wonders whether these are included among the kinds and modes of cause already distinguished, or whether they require a separate treatment. (Chapters 4, 5, & 6) Further, since many doubt whether the *end* ("that for the sake of which") is a cause in nature, or rather is unique to human, voluntary action, a further consideration of the end is necessary. (Chapter 8) Finally, there must be a consideration of the sort of necessity found in nature, for the kinds of causality recognized will determine the sort of necessity to be expected in natural processes. (Chapter 9)

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The reason for the order in this book is evident. The discussion of chance reasonably comes before that of finality, since those who deny final causality in nature invariably ascribe the goods that result from natural processes to necessity and chance. (It is remarkable that there seems to be no difference between ancients and moderns in this respect: either these goods result because the natural processes are for their sake, or they come about entirely by necessity and chance.) Further, the sort of necessity that is characteristic of nature is from the formal cause and the final cause.

Aristotle distinguishes four most general kinds of cause: material, formal, efficient, and final. As already noted, Aristotle singles out final causality for particular examination because there have been difficulties in recognizing this kind of causality in nature. For even though it is sufficiently apparent to all, both learned and unlearned, upon further reflection, difficulties that require examination have been raised. This is not surprising, since there seems to be a natural order in the discovery of the causes, and the proper causality of the good is the last and most difficult to understand. Let us consider the order of discovery in more detail.

The most evident kind of causality, which no one denies, is that of the material. When the earliest philosophers asked "what does being come from?" they meant "what *becomes* being?" For this is the distinctive mark of the material cause: it *becomes* that of which it is the cause. Failure to discover an intelligible account of such a cause led Parmenides and his disciples to deny that there is any becoming at all in things, which is a manifest denial of the natural as such. Accordingly, the disagreements of the early naturalists was not about whether there was such a cause, but only about whether it was one or many, and what its name or names should be.

One wonders why the earliest philosophers did not explicitly recognize efficient causality. For such causality is an evident object of experience, and it is clearly a different kind

of causality. (For the agent does not become its effect.) A reasonable suggestion is that, being lovers of wisdom, these thinkers were concerned with the *first* principles and causes of things, and all the agents they experienced were manifestly not such. For these were all bodies (nor was any other sort of substance conceivable), and thus derived from their own materials. Because of this, matter seemed to have absolute priority in causality. This seems to be why some posited a first material that seemed to be mobile of itself, without the need for any external mover, such as the ceaselessly moving air of Anaximenes or the round, smooth atoms of Democritus. Thus agency was implicitly reduced to the motion that seemed to be innate in the material.

Empedocles and Anaxagoras were perhaps the first to realize that explanations exclusively from material principles were inadequate. Such explanations are incapable of accounting for the differences and contrarities of things. Thus, the *love* and *strife* which Empedocles recognizes as moving principles are not composed of the materials they move, and the mind which Anaxagoras posits as a moving principle is explicitly said to be *unmixed*. For these philosophers, then, the primary agencies were not reducible to the motions inherent in the primary materials, but had a being and a power of their own. Thus, efficient causality was recognized as a distinct kind of causality.

Several of these early philosophers anticipated formal causality. Democritus speaks of the shape, order and arrangement of atoms as responsible for differences in sensible effects, Empedocles regards the soul as a sort of harmony, and the Pythagoreans name the finite and the infinite as principles. However, since none of the forms they named were substance, or such as to constitute substance, they could not be regarded as *first* principles. (This seems to be one of the reasons why they generally denied the essential differences of things consisting of the same materials.)

The first philosopher to manifestly recognize the causality of form was Plato. Here is Aristotle's account of his opinion and the reasons for it:

For from his youth first becoming accustomed to Cratylus and the opinions of Heraclitus that all sensible things are always changing, and that there is no knowledge about them, he also regarded these things in this way in later years. But when Socrates concerned himself with the ethical, and not at all with the whole of nature, seeking the universal in these things and first making thought about definitions stable, [Plato], following him along this way held that this was about other things, and not about any of the sensibles. For it was impossible that there be a common definition about any of the sensibles, as they were always changing. He therefore named such beings *ideas*, and [said] that all the sensibles were named alongside of these and after these, for it was by reason of participation that there were many things with the same names as the species.¹

Thus, as St. Thomas points out, the sort of form that Plato recognizes is the *exemplar*, a reality existing apart from the things, in whose likeness they are fashioned.

For Plato, the primary question about reality seems to have been: "what must *be* in order for knowledge to be possible?" For although the Socrates (of Plato's dialogues) professes not to know, he insists that he knows at least this: there is a real distinction between opinion and knowledge. Now since the sensibles are changeable through and through, while the universals discovered in thought remain constant, the latter must be referred to independently existing universal forms, to which the sensibles have only an imperfect and fleeting resemblance.

It is not surprising that Plato does not recognize *intrinsic* form as a principle. For not only are the forms immediately apprehended in things accidents, they also begin to be and cease to be with the things which they constitute, and so can-

¹ *Metaphysics* I, 987a32-b10.

not be unchanging objects of thought. It seems that a cause or principle should have being of its own apart from and prior to the things that it causes. An exemplar, on the other hand, exists before that which is made in its likeness, and does not cease to be or change when the latter perishes.

Though this position is reasonable (for Plato rightly insists that the knowability of things is from form), it has serious difficulties. There will be no natural science, strictly speaking, because there is no intelligibility proper to natural things. They can be grasped only as likenesses of other realities (as in metaphors). It remained for Aristotle to explain the causality of intrinsic form, by resolving the two chief difficulties of his predecessors, showing that not all intrinsic forms are accidents, but some are constituents of substance, and that these forms are only changeable *per accidens*, so that our conceptions of them remain stable, even as the particulars come and go.

But Aristotle's solution to these difficulties has been a disappointment to philosophers. For it had been assumed that the principles that explained things were sensible bodies, such as water or air, or at least imaginable bodies, such as the atoms of Democritus. And even Plato, who holds that the principles are neither sensible nor imaginable, supposes that we have had a direct and immediate vision of the universal forms, and that when we have overcome the obscuring influence of the body, we shall again contemplate them in their purity. But substantial form is not sensible or imaginable; it is an object of the understanding only. Nor is it an *immediate* object of understanding. One comes to the notion of substantial form only through a discourse of reason, and no such form can be grasped in its *specific* character except in relations to its proper effects. Thus (for example) everyone perceives that there is an intrinsic principle of life within the living, but to see that this principle is substance and form requires argument, and one can specify this form only through its proper effect, the natural, organic body. Not only does Aristotle realize, in general terms and in several examples, that what is first in reality

is not first in our knowledge, but his treatment of particular philosophical issues consistently manifests his awareness of this truth. Modern philosophers, on the other hand, following Descartes, insist that the order in things correspond to the order in our understanding; accordingly, they reject all "substantial forms and occult qualities."

Finally, Aristotle seems to have been the first philosopher to recognize the good as a cause *sui generis*, that is, to see that it has a distinct kind of causality *insofar as it is good*. For although the good is recognized as the cause of causes in Plato's *Republic*, it is described there as a form or an agent rather than as an end. Indeed, the good may be a cause as form or agent, but neither kind of causality belongs to it just insofar as it is good. Virtue makes its possessor good (formal causality), but also vice makes him bad; a good tree bears good fruit (efficient causality), but also a bad tree bears bad fruit. On the other hand, the good as good is a cause insofar as it is an object of desire and *that for the sake of which* the agent acts.

Nevertheless, it is difficult to see clearly that the good as such is a cause, and still more difficult to understand in just what way it is a cause. (A manifest sign of this is that the moderns generally deny this kind of causality, in spite of Aristotle's explicit account of it as the cause of causes.) For, in familiar examples, the end (i.e. the good) seems rather to be the *result* of the agent, and does not even exist when it is supposed to be causing. Since the agent is typically the cause of the coming to be of the end, it is hard to see how the end in turn is causative of the agent. And when one notes that the end pre-exists in the mind of the agent, its causality seems to be thereby restricted to human agency. Nevertheless, Aristotle maintains that it is the cause of causes in natural processes as well, and since rational agency presupposes the natural order, the causality of the good in nature must be prior to its causality in properly human action.

Let us now consider Chapter 8 of the second book of *Physics*, where Aristotle explicitly argues that nature acts for an end.

Aristotle begins his treatment with a plausible argument against his thesis. One might wonder why Aristotle proceeds in this way here. Would it not be more natural, and more in keeping with Aristotle's customary procedure, to present arguments for and against the thesis, and then to search out the principles from which the difficulties can be resolved? Perhaps it is sufficiently evident from common experience that nature acts for an end, at least as regards living things, so that examination is required chiefly because of difficulties arising from a defective understanding of the matter. In his commentary on this chapter, and in the Fifth Way proving that God exists, St. Thomas gives support to this view:

. . . those maintaining that nature does not act for the sake of something [propter aliquid] strove to strengthen this by taking away that from which nature chiefly seems [videtur] to work for the sake of something. But that which most of all demonstrates that nature works for the sake of something is that from the working of nature it is always found that something comes to be as well and as suitably as can be, as the foot comes to be in such a way by nature that it is apt for stepping; whence, if it should depart from its natural disposition, it is not apt for this use. And it is like this in the other cases.²

We see . . . that some things that lack knowledge, namely, natural bodies, work for the sake of an end. This is apparent from the fact that always or more frequently they work in the same way, so that they achieve that which is best. Whence it is clear that not by chance but from intention they arrive at an end.³

However, before turning to the difficulty that Aristotle raises explicitly, we shall consider the issue first in a wider context. For difficulties arise not only from a misunderstanding of the evidence that nature affords, but also from more

² *In II Physic.*, lect. xii, n. 3.

³ *Ia*, Q. 2, a. 3.

general and basic suppositions about the reality and the causality of the good.

First, there are objections that do not concern the particular evidence of natural things, or the influence of the good in properly human actions, but arise from *a priori* general assumptions (sometimes willful) about how natural things are to be understood. For many assume that natural things can be and must be fully accounted for from principles within nature herself, and that this assumption is not to be questioned by any student of nature. This opinion might seem reasonable when investigation is limited to certain particular questions, but when larger questions are raised, concerning such issues as the origins of life itself, and the coming to be of essentially different species, it becomes questionable in the extreme, and one cannot help suspecting the motives of those who profess it.

This has a bearing on the present thesis—that nature acts for an end—for, as St. Thomas observes, “this [thesis] is powerful [valet] for the question about providence, for things that do not know an end do not tend unto an end except as directed by some knower, as an arrow by an archer.” Accordingly, if one’s *a priori*, antecedent position is that the natural must be fully explained by principles within nature, he must reject the proposition that nature acts for an end, but not so much by arguing against it as by dismissing it as “unscientific.”

A notable example of this attitude (for it is hardly a reasoned opinion) is the rejection *without argument* of St. Thomas’ insight by contemporary evolutionary biologists. These simply dismiss this insight as “religiously motivated” and against the method that defines natural science, while at the same time they dogmatically assert the adequacy of their own restrictive method. But when Richard Dawkins (for example) rejoices that evolutionary theory has enabled him to be “an intellectually fulfilled atheist,” one can discern a likely origin for the attitude.

The opinion that it is unscientific to discover the effects

of intelligence in the workings of nature would surely have surprised many eminent scientists. Speaking of the order of the solar system and the arrangement of the fixed stars, Isaac Newton says:

This most elegant structure of sun, planets, and comets could not arise except from the counsel and dominion of an intelligent and powerful Being. And if the fixed stars be centers of similar systems, all these being made by similar counsel will be under the dominion of the One; especially since the light of the fixed stars is of the same nature as the light of the sun, and all systems emit light into all. And that each system of fixed stars might not by its heaviness fall into each, this Being placed the same at an immense distance from each other.⁴

Newton had devised a remarkable theory of orbital motion, but realized clearly that his explanation was particular and limited. It in no way explained the “elegant structure,” that is, the number, magnitude, arrangement, and original velocities of the planets, and since this structure is suitable and good, Newton concluded that it was the effect of “an intelligent and powerful Being.”

It is not our intention to examine the denial of divine causality further, but we have noted it here because discussions of evolutionary theories must entail a consideration of apparent finality in nature. For most of these theories require that this finality be “explained away” and the observed effects be ascribed to chance, lest one be forced to acknowledge the influence of a divine intelligent cause.

Other difficulties that are antecedent to an examination of finality in nature are those which arise from a misunderstanding of the causality of the good in human action. For although the purposes inherent in the natural order come before the purposes of the rational agent, the latter are better known to

⁴ *Principia*, Book III, General Scholium.

us. Hence, mistakes about the latter will surely entail analogous mistakes about the former.

Perhaps the most basic mistake one can make about the good concerns its relation to desire. For, as Aristotle says, "the good is what all desire," and the tradition which derives from his doctrine first and always defines the good as the *desirable*. But because the good is defined and causative through desire, some take desire itself to be the first cause. (Although this is a universal error, it arises first from a defective understanding of finality in human action.) Desire, in this view, constitutes the desirable as such. As the philosopher John Dewey maintained, the only reason for saying that something is desirable is that someone actually desires it. One cannot therefore perceive that the object is *such as to be desired*; "desirable" is nothing but an extrinsic denomination from the fact of desire.

Now such a view is against the manifest givens of experience. We remember an incident from our grade-school days, when a classmate, large in body but slow in mind, was asked by the teacher why he had done something troublesome. He simply replied, "Because I wanted to." This reply at first seemed insolent to the teacher, but she later realized that he had answered truthfully, according to his lights. Obviously he had acted out of his desire, but the teacher was asking a naturally prior question: what good was he aiming at? And this was understood by all his classmates, young as we were. Even at that age, we realized that desire is not the first cause.

At any rate, it is evident that if desire itself, rather than its object, is the first cause in human action, it makes no sense to speak of acting for the sake of some end, as if the end had a causality of its own. And if this is the case with human action, *a fortiori* it is the case with natural agents.

Finally, there are the difficulties that arise from misunderstanding and reasoning badly from the evidence of natural things. These are the particular concern of Aristotle's discussion in the second book of *Physics*. However, we should note that the evidence is not equally clear in all natural things. For

just as action for an end is more evident in rational agents than in natural agents, so is it more evident in living things than in other natural things, or in the whole order which they jointly constitute. We shall consider this further when we examine Aristotle's argument in detail.

As regards the understanding of finality in nature, there seem to be three general sources of difficulty. One of these is a confusion of universal and particular causes, and the failure to compare proper effects with proper causes. Another source of difficulty is a failure to understand the relation of necessity to finality, and to see that what arises of necessity from antecedent causes may also be for the sake of an end. The third source of difficulty is a defective comparison of finality in nature with finality in human action. For since they are both alike and different, two sorts of error are possible: to liken them in respects in which they are different, and to distinguish them in respects in which they are alike.

The first of these is the source of the difficulty that Aristotle raises explicitly, at the beginning of his discussion. Then, after Aristotle has given arguments for his thesis, he considers the difficulties arising from other sources. Our exposition will follow this order, which answers to the division of lessons in St. Thomas' commentary. Thus Aristotle first presents an argument that nature does not act for the sake of some good, but simply by necessity.⁵ He then disproves this argument, through "proper reasons" ["*rationes proprias*"].⁶ Finally, he manifests his conclusion by considering three additional reasons against his thesis.⁷

Let us now consider Aristotle's procedure in detail, beginning with his examination of the first (and, apparently, most convincing) argument against his thesis.

He begins by noting that all the early naturalists trace nat-

⁵ To 198b34.

⁶ 198b34-199a32.

⁷ 199a32-end.

ural effects back to the *necessary*, as to a first and sufficient cause. Thus, in their view, the natural does not come about as it does for the sake of some good, but simply from an antecedent necessity in its materials. Aristotle then states and explains an argument, in the form of an objection, which supports this position.

. . . what prevents nature from acting not for the sake of something nor because it is better so, but as Zeus rains, not so the grain might grow, but by necessity. For what rises must cool, and the cooled, coming to be water, must fall down. But when this comes to be, growth occurs in the grain. So too, if the grain on the threshing-floor is destroyed by this, it did not rain for the sake of this, that it might be destroyed, but this occurs.⁸

He then applies this conclusion to other cases of apparent finality in nature.

Whence, what prevents the parts in nature from being like this, for example, our teeth arising by necessity, the front ones sharp and fitted for cutting, the molars flat and useful for grinding the food, since they did not come to be for the sake of this, but this just fell out? And so too in the cases of the other parts in those in which that for the sake of which seems to belong.⁹

Finally, he completes the objection by explaining how it came about that things are "suitably constituted," giving the opinion of Empedocles as an example.

Wherever, therefore, everything comes together as if it came to be for the sake of something, these were saved, being suitably constituted by chance. But whatever was not of this sort was destroyed and is destroyed, as Empedocles says man-faced ox-progeny was.¹⁰

⁸ 198b16-23.

⁹ 198b23-29.

¹⁰ 198b29-34.

Now, concerning this argument, certain preliminary considerations are relevant. First, what is meant by "necessary" here? It clearly refers to the necessity that arises from antecedent causes—the matter and the agent, but it cannot be the necessary that is opposed to accident and chance, for the latter are an essential part of the account. Some thinkers (Laplace is a prominent example) hold that "chance" is simply the name that ignorance gives to necessity, and that in reality every single thing comes about by an altogether determinate necessity. But no such view of necessity is involved here. Rather, there is the sort of necessity we mean when we say "accidents will happen." The *singularity* of occurrences is not determinate beforehand, but something of the sort is bound to happen. There will be tornadoes in Kansas this summer, but when and where and how they will be are not determined beforehand. Such is the case with rainfall in the objection: the rain will surely fall at some time and at some place, and it will result in the growth of some plants and the destruction of others, sooner or later. The force of the objection, then, is that it is a mistake to say that the rain falls for the sake of the growing grain. Its only tendency is to fall, and whether there be growth or corruption depends entirely on what happens to be below.

Further, as we noted above, finality in nature is nowhere so evident as in the structure and behavior of living things, as in Aristotle's example of the development of the teeth. To determine the proper good realized by the natural movements of inanimate things is difficult, as in the falling of the rain. For how is it good for water to locate itself, as it does, between earth and sky? Likewise, to see how the natural movements and activities of one thing may be ordered to the good of another is often difficult, though in cases where the benefit is mutual, as with the bees and the flowers, it can readily be seen. However, the argument assimilates the more evident example of finality (the development of teeth) to the less evident (the falling of rain), objects to the latter, and concludes

universally. No account is taken of the manifest differences between the two examples. If one judges a natural attribute from cases where it is only obscurely present, one is liable to deny it altogether.

It should also be noted that the completion of the argument anticipates the principal objection against it. For if the parts and activities of living things have no purpose, why do we universally observe that they always "work in the same way, so that they achieve what is best"? Empedocles here anticipates the method of many later thinkers: the appeal to imaginary evidence. He imagines a vast array of living things, put together, as it were, at random, most of which were not fit to live. This allows him and his later followers to represent the entire world of our experience as a rare but happy exception. One is reminded of those evolutionary theorists who, assuming (apparently) that something can come from nothing, bit by bit, imagine an immense variety of minutely different transitional forms, arising one from another over immense stretches of time.

Yet this argument has the virtue of bringing to mind the various ways in which there is finality in nature, and the order among these ways, both in our knowledge and in reality. For there is purpose in the structure and functions of single organisms (the animal's teeth), in one natural thing serving another, and the non-living, the living (rain and growth), and other natural things serving man (the threshed grain). Finally, the ordination of all these parts to the whole of nature is implicit in the examples. But that which is principally intended by the Author of nature, the perfection of the whole, and the order of the parts to one another within that whole, is the hardest for us to discern clearly. Here, again, what is first in reality is not first in our knowledge.

But why does this argument bring together such different examples of finality in nature, assimilating the more evident to the less evident? The most significant cause is noted by St. Thomas in his commentary:

But it should be considered in this account that it takes an unsuitable example. For although rain has a necessary cause on the part of the matter, it is nevertheless ordered to some end, namely, to the conservation of generable and corruptible things. For on account of this there is mutual generation and corruption in these lower things, that perpetual being may be conserved in them. Whence the growth of the grain is unsuitably taken as an example, for a universal cause is being compared to a particular effect.¹¹

The mistaken assimilation of the two examples arises from a confusion of universal and particular causes, and a failure to relate effects to their proper causes, which we noted above as a cause of difficulties.

Aristotle distinguishes *universal* and *particular* modes of causes in the third chapter of the second book of *Physics*:

... cause is said in many ways, and those of one kind are prior and posterior the one to the other, as the doctor or the artist is the cause of health, and the ratio two to one or number is the cause of the octave, and, always, the containing things in relation to the particular things.¹²

What Aristotle here names 'prior' and 'posterior', St. Thomas also names universal and particular (or 'proper'), which is in keeping with the examples Aristotle gives. But St. Thomas also makes a further distinction of universal and particular causes:

But it ought to be noted that universal and proper cause, or prior and posterior, can be taken either according to a community of predication, as in the examples given here about the doctor and the artist, or according to a community of causality, as if we should say that the sun is a universal cause of becoming hot, but fire, a proper cause.¹³

¹¹ *In II Phys.*, lect. xii, n. 5.

¹² 195a29-32.

¹³ *In II Phys.*, lect. vi, n. 3.

At the beginning of *Physics*, Aristotle proposes to investigate the most universal principles and causes of natural things. He begins with these, as he says, because they are more knowable to us. Thus, the causes that he first distinguishes are matter, form, and privation, which are causes most universal in predication. Likewise, the universal causes he mentions in the text just quoted are causes universal in predication. How do these compare with causes universal in causality?

These two sorts of universal causality are alike in that in both cases the more universal cause extends to more effects. More things are made of metal than are made of gold, and more things are made by artisans than are made by carpenters. Likewise, more words contain the letter 'a' than the syllable 'an,' and more soldiers move at the command of the general than at the command of the captain. Also, in both cases, universal causes should be correlated with universal effects, and particular causes with particular effects.

In other respects, however, the two cases are quite different. A cause universal in predication is distinct from particular causes only *logically* (i.e. in account or definition). Gold is also a metal, and a carpenter is also an artisan. But a cause universal in causality is a *different reality* from the particulars under it. A letter is not the syllable it composes, nor is the general the captain who serves under him. Also, the cause universal in predication is not a cause of the particular cause. Gold is not made of metal, nor is an artisan the mover of the carpenter. But the letter is the matter of the syllable, as well of the word, and the captain moves at the command of the general. Further, the cause universal in predication cannot account for the differences among the particular causes and effects. From what it is to be metal, one cannot account for the difference between gold and iron, or the difference between a metal cup and a metal knife; from what it is to be an artisan, one cannot account for the difference between a carpenter and a plumber, or for the differences among their effects. But the most universal causes in causality (except in the

genus of material cause) are also causative of the differences among the particular causes and their effects. This last distinction, however, is somewhat obscure to us, since the universal movers and exemplars best known to us are not causes of the entire being of their particulars, and the latter have many movements not caused by those universal causes. Thus, the general does not cause the being of the soldier, and the latter has many movements that do not derive from his superior. Also, as St. Thomas observes, the effect proper to the universal cause is *named* generically ("quodammodo secundum rationem universalioris praedicationis"), which might lead one to think that the universal cause causes only what is generic in the effect. But it is rather like naming *color* as the object of sight, for although the object of sight is named generically, the power truly distinguishes all the differences of color.

Arising from these distinctions is a difference in knowability. The universal in predication is as close to us as the particular; metal is as much an object of sense as gold is. And insofar as it is a confused whole, it is more known to our understanding,¹⁴ though the use of a generic name indicates the achievement of a certain clarity. But the causes universal in causality are, for the most part, hardest for us to know, and, in this life, we have access to them only through their effects.

Turning, then, to the argument against finality in nature, we see that the objector has wrongly correlated cause and effect. The end to which the rainfall is ordered is not the growth of *this particular* field of grain (as opposed to *that*), although the end is accomplished thereby, but rather the growth and conservation of living things. The procedure of nature here may be compared to the action of a hunter with his shotgun. It is not the latter's intention that *every* pellet in the shell should hit the duck (for that would leave nothing to eat), nor is it in his power, nor does he intend, that *these* pellets rather than

¹⁴ *Physics* I, ch. I.

those should hit the duck. It is enough that *some* should do so. Likewise, in nature, rainfall ensures the conservation of the kinds of living things, and this may be accomplished by rain falling on that field as well as on this.

Another example of nature's order, taken from our own back yard, so to speak, is the multitude of acorns produced by an oak tree. Most of these will never sprout, nor is it desirable that they should. But this profusion of seeds ensures that the race of oaks will continue, while the acorns that do not sprout are eaten by animals, which enables *them* to survive. Indeed, we see that the economy of nature is more perfect than the hunter's arrangements, for the pellets from the shell that miss serve no further purpose.

Is the cause of the conservation of living things by the rainfall universal in predication? In speaking of the correlation of such a cause with its proper effect, Aristotle says:

Moreover, the genera [are to be referred] to the genera and the particular to the particular, as sculptor to statue, and this [sculptor] to this [statue].¹⁵

If we were to understand the cause as universal in this sense, we would say that as rain is ordered to the conservation of living things, so is this rain ordered to the conservation of this particular field of grain. But, as we have already noted, there is no such determinate tendency in the rain. It is not like *this* gardener watering *this* garden. So if the cause here is not universal in predication, is it universal in causality, and if so, what would properly be regarded as such a cause?

Since the rain helps the plants to grow, one might suppose that the rain is the cause in question. But both in the argument, and in St. Thomas' criticism, the rainfall is considered as an effect. For the question is: why does the rain fall? Is it in order that the plants may grow, or simply from the necessity of the materials? Thus, when St. Thomas speaks of a univer-

¹⁵ *Phys.* II, 195b25-27.

sal cause, he must mean the *final* cause, for he asserts that the rainfall is ordered to the "perpetual being" of "generable and corruptible things." Also, the rainfall here seems to be the particular effect St. Thomas is referring to, for at issue (in the objection) is *this* rain falling on *this* field, and *that* rain falling on *that* field.

However, since the end must be correlated with the proper agent, what would be the universal agent at work in the conservation of living things? It could hardly be the rain, for the rain does not order itself to its end, as a rational agent might. The cause must then be the agent that orders the rain to such an end, and since this order is inherent in the natures of the things, the proper agent must be the Author of those natures. Indeed, with respect to both the agent that orders it and the living things it conserves, the rain seems to be an instrumental cause.

Further, just as the proper and immediate end of the acorn is the plant that it becomes, while the nourishment of animals is a universal and remote end, so the proper and immediate end of the rainwater, as it falls, is the place to which it is natively inclined, while the conservation of living things is a universal and remote end. But in this ordering, both the acorn and the rainwater differ from the order that follows human art, for it is within the nature of the things themselves, while that latter is achieved only through accidental forms, and is not, properly speaking, *in* the things themselves.

Now if the natural thing, by its nature, is part of a system or order in which one part supports another, and (universally) every part is for the sake of its whole, the most universal end *within* the things must be the perfection of the whole. This end arises from the interdependence and due proportions among the parts.

We see, then, the cause of the difficulty in the objection. Finality in nature is not equally apparent in every case. In recognizing finality in nature, we must begin with the cases where it is most apparent: the structures and functions of particu-

lar living things. Difficulties that arise in other cases should not lessen the certitude of our judgments in these cases. Nor is it surprising that we should find difficulties when we are looking to more universal ends, for these, as we have noted, though first in reality, are last in our knowledge. A reasonable procedure, then, as we move toward an understanding of more universal ends, is to consider first the cases where one natural thing manifestly cannot be without another, for the good is readily apparent in such cases, and it can hardly be regarded as an accident.

Let us now begin the second part of our discussion: the five arguments ("rationes propriac") by which Aristotle establishes his thesis. Here is the first:

But it is impossible that this is the way things are. For these and all things which are by nature come to be in a certain way either always or for the most part, but none of the things which are by luck or chance do this. For to rain much during winter does not seem to be by luck or by a coincidence, but during the dog-days; nor for there to be burning heat during the dog-days, but not during the winter. If, therefore, these things seem to be either by coincidence or for the sake of something, and if these things are not able to be by coincidence nor by chance, they must be for the sake of something. But indeed, all such things are by nature, as even those saying these things admit. There is therefore "that for the sake of which" in things which are and which come to be by nature.¹⁶

The argument requires three suppositions: (i) what is by nature occurs in a certain way always or for the most part, while what is by chance does not; (ii) the good that is the outcome of a natural becoming is either an accident, or it is that for the sake of which the becoming has occurred; and (iii) such things as the falling of the rain and the development of the teeth are by nature. The third of these suppositions is

¹⁶ 198b34-199a8.

not in dispute; all agree that these things are by nature. The first derives from a previous discussion in Chapters 4, 5, and 6, though, as Aristotle's example suggests, everyone agrees that what happens always or for the most part is not by chance. But the second supposition requires some examination. Are these the only alternatives: "these things" come to be "either by coincidence or for the sake of something"? Aristotle only says that this "seems to be" the case.

That these are the only alternatives is at least probable, for no one has ever suggested a third possibility, or, if someone has, he has kept it well hidden. But one can also see why these are the only alternatives. In the last part of the chapter, Aristotle says:

For those things are by nature which, being moved continuously from some principle in themselves, reach some end. But the same end is not reached from each principle in each case, nor any chance end: rather, each thing always reaches the same end, unless something impedes it.¹⁷

Accordingly, if the end of a natural movement or becoming is a good, either it is or is not an accident that it be so. But if it is always or for the most part good, it cannot be accidental that it be good. The movement or becoming must then be tending to the good *as good*.

This indicates what we are attending to in the things themselves, when we say that nature acts for an end. For this is not like our knowledge of finality in art. For there we propose an end to ourselves, devise an appropriate course of action, and follow that course of action for the sake of that end. But here we are proceeding from effect to cause. We observe that a natural movement or becoming is quite determinate *in its tendency*. For though it can be impeded from without, it always tends to the same end, from the same beginning, and through the same intermediates. Observing that the end in

¹⁷ 199b15-18.

each case is a good, we conclude that the tendency of nature is toward the good *as good*, and this is what it first means to say that nature acts for an end.

In Aristotle's *De Anima*, there is a wonderful text about the end of the generative soul, the end for which rainfall is instrumental:

For the most natural of the works for living things, as many as are grown up and not maimed, or do not have spontaneous generation, is to make others like themselves, an animal, an animal, and a plant, a plant, so that they may partake of the everlasting and the divine, as much as they can. For all things desire that, and for the sake of that, do whatever they do by nature.¹⁸

Since individual animals and plants cannot live forever, they seek such immortality as is possible to them, in the continuing generation of others of their kinds. And this is the universal good for the sake of which the rain falls. But the natural agents do not know what they are doing or why they are doing it, nor do they intend the sprouting of this seed rather than that, or to water this seedling rather than that, unlike the gardener, who may intend this individual outcome as such.

Now let us turn to the second and third of Aristotle's arguments. We shall discuss them together, for, as St. Thomas says, the third seems to be a "complement and explanation" of the second.

Moreover, in things in which there is an end, the prior and successive things are done for the sake of this. As a thing acts, therefore, so is it naturally apt [to act]; and as it is naturally apt [to act], so each thing acts, unless something impedes it. But it acts for the sake of something, therefore it is also naturally apt to act for the sake of something. For example, if a house were among the things which come to be by nature,

¹⁸ *De Anima II*, Ch.4, 415a26-b2.

it would come to be as it does now by art. If, on the other hand, things which come to be by nature could come to be not only by nature but also by art, they would come to be in the way in which they are naturally apt to. Therefore one thing is for the sake of another.¹⁹

And, generally, art carries to an end some things which nature cannot work out, and imitates others. If, therefore, things which are according to art are for the sake of something, it is clear that things according to nature are too. For the posterior is to the prior in a similar way in what is according to art and in what is according to nature.²⁰

This argument goes somewhat beyond the first, by examining the natural movement or becoming from beginning to end. Thus, the principal conclusion seems to be what Aristotle states at the beginning. Given that there is an end ("that for the sake of which") in natural activity, Aristotle argues that in natural movement or becoming, the prior is for the sake of the posterior, and all for the sake of the end.

After his first statement, then, of what is to be concluded, Aristotle makes a brief argument that is at once a definition and a proof of finality in nature. For (he says) as a thing acts, so is it naturally apt to act, and since the natural thing always acts for an end, it is naturally apt to do so. And this "natural aptitude for an end" (in St. Thomas' words) is what it means to say that nature desires an end. The premise that natural activity is for the sake of an end was established by the first argument, that the good is not realized by chance. But the way things act always, unless impeded, is the way they were "born to act" (a simpler translation of the Greek)—that is, such activity arises from principles that constitute the substance of the thing. Thus, the argument moves from the premise that the activity is for the sake of an end to the conclusion that

¹⁹ 199a8-15.

²⁰ 199a15-20.

nature desires the end. What is meant by "desire" here is an inclination or tendency to the good *as good*, whether or not this involves knowledge—"ipsum autem tendere in bonum est appetere bonum."²¹

But in order to reach his principal conclusion—that "the prior and successive things are done for the sake of [the end]"—Aristotle points to resemblance in the procedures of art and of nature. But what is this resemblance? For these are not alike in every respect; for example, in the coming to be of an artifact, the parts are originated separately, and then put together, while the parts of a natural, living thing originate from within. (For nature is an intrinsic principle, and art, an extrinsic principle.) But there is this resemblance, which seems to be what Aristotle intends. In either case, the intermediates are such that the end cannot come about except through them, and in their order, nor can what comes after be without what comes before. Further, the earlier steps are as much as is required for the later ones, and no more. But in art the intermediates are such because the ones before are for the sake of the ones after, and all for the sake of the end. So also in nature, the intermediate steps must be for the sake of the end. Accordingly, if natural things were to come to be by art, they would come to be in the way they now come to be by nature, for this way is determined by the things to be generated. Likewise, if nature were to produce what now comes to be by art, it would have to follow the way that art now follows.

This order of the prior to the posterior, and the reason for it, it first known to us in art. But we see that it is more universal and more thorough in nature than in art, especially as regards the absence of superfluity. Some of us remember the cartoons of Rube Goldberg, where ridiculously complicated mechanisms were devised for the accomplishment of simple tasks. Nature shows us nothing of the sort, while in-

²¹ *In I Ethic.*, lect. i, n. 10.

artifacts are often ridiculed as "Rube Goldberg contraptions." "What's *that* for," says the critic, casting a cold eye on some strange protuberance. For art must be perfected—become more like nature, in fact—before such superfluities can be eliminated.

In the third argument, Aristotle completes the second by explaining that in some cases art "carries to an end" ("perficit") what nature cannot finish, while in others, it imitates the natural. For most artifacts are completions of what nature has begun and carried forward, but cannot complete. Nature has supplied our hands (for example), but not the many tools needed for all necessary activities; the tools made by art are, as it were, extensions of the hand. Likewise, nature has left us without our final covering; clothes are an external completion of our substance. (One might say that nature has not given us, for she cannot give us, the appropriate plumage.) And even when the arts are not completing our substance, in the way they do, they are still imitating the natural. But art could not be the complement of nature's activity, nor could it be an imitation of nature, if the natural were without purpose.

The fourth of Aristotle's arguments is taken, as St. Thomas notes, from "those things which more manifestly in nature are seen to work for the sake of something" [*'ab iis quae manifestius in natura propter aliquid operari videntur'*].

But this is most apparent in the other animals, which act neither by art, nor by inquiring, nor by deliberating. Whence some people are at a loss as to whether spiders and ants and such things work by mind or by something else. Going along according to small steps, it is apparent even in plants that what comes to be is brought together for the end, as the leaves are for the sake of shading the fruit. Whence, if the swallow makes its nest and the spider its web by nature and for the sake of something, and the leaves of the plant are for the sake of the fruit and the roots go not up but down

for the sake of food, it is apparent that this sort of cause is in things which come to be and are by nature.²²

Earlier in this discussion, we noted that the evidence for Aristotle's thesis is not equal in all cases. Finality is most evident in living things, less evident in non-living things that serve living things, and least evident when non-living things are considered in themselves. Here Aristotle carries the comparison one step farther, noting that finality is more apparent in animals than in plants. Upon reflection, this certainly seems true, and not surprising. For since finality is most apparent in properly human action, it is likely to be more apparent in those organisms which are more like man than in those which are less so. Also, the greater complexity of animals, in which more components must be adjusted one to another if the good is to result, makes it even more difficult to attribute a good outcome to chance. And no one ever thinks that a plant knows what it is doing, but one might think that an animal does. Further, in Aristotle's example of leaves shading the fruit, the good is less clear, especially as compared to the earlier example of the development of the teeth. Thus, one is again reminded of the principle of method stated before, that one should examine a common attribute first in those cases where it is most evident.

However, as St. Thomas argues, even the animals do not work from understanding:

But nevertheless it becomes manifest that they do not work from understanding, from the fact that they always act in the same way. For every sparrow makes its nest in the same way, and every spider makes its web in the same way, which would not be if they worked from understanding and art. For not every builder makes a house in the same way, since

²² 199a20-30.

the artisan is able ["habet"] to judge concerning the form of the artifact, and can vary it.²³

Aristotle's fifth argument is the most universal, for it sees finality in nature as a particular of the universal principle that everything potential is for the sake of its actuality.

And since nature is twofold, being, on the one hand, matter and, on the other, form, the end being the latter, and other things being for the sake of the end, this will be the cause "that for the sake of which."²⁴

As it is evident that learning and the ability to know are for the sake of knowing, and (universally) becoming and the ability to be, for the sake of being, so is matter (that which *can be* something) is for the sake of form (that whereby it *actually is* that something). And as matter is for the sake of form, so is form (first actuality) for the sake of operation (second actuality.) Thus, *nature*, whether matter or form, is for the sake of an end.

We now turn to the third part of our discussion, Aristotle's resolution of additional reasons against his thesis. St. Thomas divides this part into three, according to the three things "from which some seemed to be moved to deny this."

The first of these is the occurrence of monstrosities in the operations of nature. Although the imaginary examples given by Empedocles are by no means typical, monstrosities do come about. But since they rarely occur, they can neither be supposed to be nature's intention, nor a good reason to conclude that nature has no intentions. Thus, a reply to this objection has already been given, in Aristotle's first argument.

However, there is a further reply to be given, from a comparison with art, as well as from the very wording of the objection.

²³ *In II Phys.*, lect. xiii, n. 5.

²⁴ 199b30-32.

Mistakes come to be even in the things which are according to art, for the grammarian may not write correctly and the doctor may not pour the drug correctly. Whence it is clear that mistakes can happen even in things which are according to nature. If, then, there are some things which are according to art, in which what is done rightly is for the sake of something, but in those which are done mistakenly, one sets to work for the sake of something, but it is missed, the case can be similar in natural things, and monsters are mistakes of that which is for the sake of something.²⁵

St. Thomas makes explicit a further likeness between nature and art in this respect:

For if art were not acting toward a determinate end, howsoever art worked, there would not be a mistake, since the working of nature would have itself equally to all [outcomes]. Therefore, this very fact that in art there happen to be mistakes, is a sign that art works for the sake of something. And so does it also come about in natural things, in which monsters are, as it were, the mistakes of nature acting for the sake of something, insofar as the right working of nature fails. And this very fact that in natural things there happen to be mistakes is a sign that nature is acting for the sake of something.²⁶

Here is an example, then, of one of the causes of error noted earlier: a defective understanding of the likeness of the processes of nature to properly human activity.

To this reply, the principal one concerning monstrosities in nature, Aristotle adds three more. Two of them, the first and the third, call attention to the *order* in natural processes, while the second notes an inconsistency in Empedocles' position. We shall consider this one first.

Moreover, even in plants that for the sake of which exists, though plants may be less articulated. Did, then, even

²⁵ 199a34-b4.

²⁶ *In II Phys.*, lect. xiv, n. 3.

in plants, "olive-headed vine-progeny" come to be, just as "man-faced ox-progeny," or not? For that would be strange. But it must have been so, if this happened among animals.²⁷

The argument is *a fortiori*. If such monstrosities were once common among animals, where the evidence for finality is more distinct, they should have been even more frequent among the plants. But Empedocles speaks of no such plant as an "olive-headed vine-progeny."

The other two replies are more universal, regarding not the imaginary past which Empedocles' theory requires, but the order in nature as we see it now.

Moreover, it is necessary that the seed come to be first, but not right away the animals, and the "first very natural things" were seeds.²⁸

Moreover, even among seeds, whatever chanced must have come to be.²⁹

In the making of a complex artifact, the parts are produced separately, and then put together to make the whole. Further, just as these parts do not depend upon their union in the whole in order to be, neither do they have any intrinsic tendency toward that union. This is why the artisan can produce monstrosities at will. But the living thing does not originate in this way. It begins as a single seed, relatively simple, and the parts develop determinately, by internal differentiation. We have no experience of them coming about in any other way.

Thus, the cause of the error here is the failure to rightly distinguish the natural from the artificial. The first difference between nature and art is that nature is an intrinsic and essential principle, while art is extrinsic and accidental. And neither do the seeds come to be at random. For just as *this* animal comes to be from *this* seed, so does *this* seed come to be from

²⁷ 199b9-13.

²⁸ 199b7-9.

²⁹ 199b13-14.

this animal, and in either case there is a *determinate sequence* in the becoming. Those who, like Empedocles, suppose that the natural living thing could arise through a random combination of separately existing parts are judging from imagination rather than sensation.

The second thing that moves some to deny that nature acts for the sake of an end is that the coming about of natural effects seems to be adequately accounted for by *antecedent* causes. This is not stated by Aristotle, but St. Thomas, recognizing that this final part of the chapter seems to be replies to objections, makes explicit what the text of Aristotle only implies.

For this seemed to some to be so [i.e. that nature does not act for an end], because the things that naturally happen seem to proceed from prior principles, which are the agent and the matter, and not from the intention of an end.³⁰

One might perhaps fault St. Thomas here for supposing something not supported by Aristotle's text. But this would be an issue of interpretation, not of doctrine. For this objection completes the objection raised by Aristotle at the beginning of the chapter. There it was argued that nature does not act for the sake of an end, because (apparently) the same natural process—rainfall, for example—brings about good and bad effects indifferently. Here that objection is completed, by arguing that the antecedent causes, acting with no particular intention, but at random, bring about the natural effects of necessity. No other causes are needed.

Now the necessity that is posited here is not opposed to chance, as was explained earlier. Nor is Aristotle denying that natural effects have causes that are necessary in this sense. The question is whether such causes are complete and sufficient *of themselves* for the workings of nature.

One might argue for their sufficiency in this way. If these causes are present and at work (and they must be at work sometimes), will not the effects necessarily follow? Given the

³⁰ *Ibid.*, n. 7.

inborn heaviness of water, rain must fall at some time, causing some things to grow and others to rot. What more is needed?

Aristotle's reply is that, assuming this—that natural things arise simply from antecedent causes by necessity and chance—one does away with nature and the natural as such.

The one who speaks thus wholly does away both with the things which are by nature and with nature. For those things are by nature which, being moved continuously from some principle in themselves, reach some end. But the same end is not reached from each principle in each case, nor any chance end: rather, each thing always reaches the same end, unless something impedes it.³¹

Perhaps these thinkers are imagining some possible state of affairs, though that is unlikely, but they are not describing the natural, and even less are they explaining it. For the very reason to call something natural is that it is moved continuously from a determinate beginning to a determinate end, through determinate intermediates. Although the term is not infallibly reached, the tendency is altogether determinate, and failure is due to impediments. Thus, these thinkers have replaced (in thought) the natural world of our common experience with an imaginary world of their own.

Let us consider likely causes of error in this case. First, as noted before, there is failure to rightly correlate universal causes with universal effects, and particular causes with particular effects. Joined with this, there is the reduction of more evident cases of finality (such as the development of the teeth) with less evident cases (such as the outcome of rainfall), which can lead to a universal doubt about finality in nature. But one wonders why these thinkers should have ignored the proprieties of the natural as they did. Did they think that by prescinding from the natural as such they could find a simpler explanation? (Simple explanations are desirable.) Although this would eliminate the natural as a distinct kind of

³¹ 199b14-18.

being, one would have achieved an impressive simplicity and universality of understanding. For there would be the same general account of all sensible beings, whether natural, artificial, or simply accidental.

However, there is another cause of error here, involving a deeper and more universal difficulty. This cause might be called the illusion of adequacy. When one has discovered a particular cause at work, which is *sufficient* to produce a given effect, he may suppose that he has an adequate and complete explanation of that effect. But he may also be overlooking what that cause in turn depends upon in order to be the cause of that effect. Thus, there may be determinants in the working of that cause that are not inherent in it, and cannot be accounted for by positing other causes of the same sort. For example, Democritus says that his atoms move "by bumping and knocking," as if that were a sufficient account. Clearly, however, bumping and knocking presuppose motions determinate in direction and speed, and these cannot be accounted for by positing previous collisions and motions *ad infinitum*. Democritus seems to think that since every particular movement results from a particular collision, and this has always been so, he has a sufficient account of the movements of his atoms. This is like explaining the existence of the human race by saying every man had a father. Aristotle elsewhere criticizes this sort of explanation.

Generally, however, thinking this to be a sufficient principle, that something is or comes to be thus always, is not rightly supposed, to which claim Democritus reduces the causes concerning nature, [saying] that it also came to be thus before. However, he did not think it worthy to seek the principle of this "always", speaking rightly about some things, but not about all things. For even a triangle has its angles always equal to two right angles, but nevertheless, there is some different cause of this "always". Yet of principles there is not a different cause of being eternal.³²

³² *Physics*, VIII, 252a32-b5.

This illusion of adequacy seems to arise, at least in part, from not realizing that the causes we first discover are all *caused* causes. Such causes either depend upon other causes of the same genus, as compound materials and moved movers do, or (as here) upon other genera of causes. For although matter and form (for example) are *per se* causes of the composite, and when the matter takes on form, the composite will surely result, the agent is the cause of the union of form and matter, and thus the cause of their causality. And, for the most part, these prior causes are not apparent, or less apparent *as causes*, and can only be reached by a discourse of reason.

As regards finality in nature, we see that the objectors have not sufficiently grasped the causes that are *pre-supposed* to the causes (necessity and chance) that they recognize. This is most clear in the case of chance. As Aristotle has shown beforehand (in Chapters 4-6), the goods that come to be by luck or chance are accidental and unusual effects of causes that are directed *per se* at other goods. Thus, such effects pre-suppose a principle acting for a definite end and good, and thus (in both nature and art) depend upon agents acting for the sake of an end. Furthermore, the antecedent causes do not produce any effect except insofar as they have determinate tendencies to particular ends. For insofar as the matter is simply capable of contraries, nothing follows; the matter must be determined by form, and from this determination follow movements that tend to definite ends through definite intermediates. For example, the *heavy* (which is formed matter) tends definitely to the center. Likewise, the natural agent only acts from a definite tendency toward a definite end. For example, *this* kind of animal produces only *this* kind of seed, through a definite series of intermediates. But tendencies are what they are in virtue of the ends to which they are directed, and we see, at least by induction, that in nature these ends are good. Indeed, one must suppose that these ends are *such as to be inclined to*, and only the good is such. Thus, not only does nature act for an end, but the end is the causes of causes in natural activities and becomings.

All of this is quite clear in such cases as the development of the teeth. In other cases, where one thing, by its proper movements, serves the good of another, the intention of nature is less clear. But, as we have noted above, our understanding of such cases is obscured and confused by a failure to rightly understand the distinction of universal and particular causes. In order to rightly distinguish such causes, and relate proper causes to proper effects, it is helpful to compare the good to be achieved to the *power* of the agent and its instruments. For the limits of that power will also limit the extent to which the good can be achieved, and the ways to achieve it. Just as it is not within the power of the hunter and his gun to determine which pellets in the shell will hit the duck, neither is it in the power of the natural agent, insofar as rainfall is the instrument, to determine which plants will grow. Unless one makes this comparison, one is apt to think either that nature is striving for ends that cannot be reached, or that it does not intend the resulting goods at all. Thus, if the end intended is that *some* pellets should hit the duck, and thereby bring him down, the adept hunter will usually succeed. Likewise, if it be the intention of nature that *some* seeds of this kind sprout and develop, and the species be thereby immortalized, for the most part, the end is reached.

Finally, the third thing that "moves some to deny that nature acts for the sake of an end" is that in natural processes "the mover is not seen deliberating." This objection is, in a way, the reverse of a difficulty Aristotle mentioned earlier:

But this [purposeful action] is most apparent in the other animals, which act neither by art, nor by inquiring, nor by deliberating. Whence some people are at a loss as to whether spiders and ants and such things work by mind or by something else.³³

The manifestly purposeful behavior of animals inclines one to think they know what they are doing. Here, on the other

³³ 199a20-23.

hand, it is argued that because they do not deliberate, they are not acting for the sake of an end. But taking art as an instance, Aristotle shows that not all purposeful action requires deliberation in the agent:

It is strange not to believe that something comes to be for the sake of something if the mover is not seen deliberating. For even art does not deliberate. If the ship-building art were in the timber, it would act by nature in the same way. Whence, if that for the sake of which is in art, it is also in nature.³⁴

Both of these difficulties have the same origin: the supposition that what belongs to purposeful action *in its perfection* belongs to all cases of such action. For since the rational agent can apprehend the end as end, and direct himself to it, he can act for an end most perfectly; he is more the author of his purposeful activity.

St. Thomas enlarges upon Aristotle's consideration of art:

Nor does the artisan deliberate insofar as he has the art, but insofar as he falls short of the certitude of art. Whence, the most certain arts do not deliberate, just as the writer does not deliberate about how he ought to form the letters. And also, those artisans who deliberate, after they have found a certain principle of art, do not deliberate in the execution. . . .³⁵

The need to deliberate is because of a deficiency in the artisan; the more perfect he is in the possession of his art, the less he needs to deliberate. Nature is thus like an art perfectly possessed: the means are completely determined. And this likeness is most clearly seen in the execution ["in exsequendo"], when the deliberation and choice which are prior to a man's exercise of his art have already been completed. The artisan then proceeds to act, unless impeded.

³⁴ 199b26-30.

³⁵ *Ibid.*, n. 8.

FINALITY IN NATURE

Aristotle then completes this consideration by indicating where the exercise of art is most clearly like the action of nature. For, he says, this likeness is most clear "when someone cures himself." The difference, of course, as Aristotle had pointed out in the first chapter of this book, is that it is accidental that the principle of healing—the art of medicine—be in the one being healed, while it is essential that the principle which is nature be in the thing moving or developing, as (for example) the principle of growth must be in the growing thing.

CUTTING THE INFINITE DOWN TO SIZE

Marcus R. Berquist

Aristotle defines the *continuous* in two ways. In *Categories*, the Continuous is "that whose parts have a common boundary." In *Physics*, it is "that which is divisible in infinitum." These definitions are not opposed, but complementary: the first is by way of composition—it indicates how the many that compose the continuum are *one*; the second is by way of resolution—it indicates how the one continuum is also *many*.

In both definitions, the *indivisible* ("that which has no parts") is included, at least implicitly. For the common boundary of the parts of a continuum is indivisible, and the division of the continuum is also effected by the same indivisible. In these accounts, the indivisible is never regarded as a *part*; it is that by which the parts are joined, and that by which each part is limited. Thus, the continuum does not consist of indivisibles, nor is it divided into them. A line does not consist of points, nor a motion of moments, nor time of instants.

Now the division of the continuum necessarily involves number: a magnitude is divided into a number of parts, each of which is *one*. But such a part is not perfectly a unit, since it is in turn divisible into many. Because of this, and because of the reasonable premise that the divisible pre-supposes the indivisible, one is inclined to think that there must be an *ultimate* division of the continuum into parts that are absolutely indivisible. Accordingly, the continuum (it seems) must ultimately consist of indivisible units; the line, in the first case, must consist of points, for a divisible consists of the parts into which it is divided. Although this supposition is not consistent with one's prior conception of the continuum, according