On Aristotle's Parts of Animals
Book One, Chapter 1

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Aristotle begins The Parts of Animals by proposing to consider the criteria for evaluating the manner in which those who claim to be experts about nature present their teachings. Why does he begin in this way? Why doesn't he, instead, simply present what he regards as the first principles and the true conclusions of the science of nature, in the way that Euclid presents his geometry, for instance, and not worry so much about the manner of presentation? Well, I suspect it's because he thinks that expertise or science of nature is not available, at least not in the comprehensive sense that would be sufficient to rule out legitimate controversy. Since we don't know with certainty why nature has to be the way it is, or even whether it does have to be the way it is, there are bound to be controversies about the best way of presenting what limited knowledge we do have. One of the broadest of these controversies is between those, on the one hand, who try to explain natural beings in terms of their simplest constituents, along with the processes through which the more complex beings happen to have developed from these constituents, and those, on the other hand, who try to interpret these same processes as evidence of a striving in nature toward what is higher, better, or more complete. This controversy is reflected today in the debate between Darwinian evolution and Creationism -- although the near-complete victory of Darwinism within the scientific community has meant that those who want to argue for a Nature that aims at the good usually feel compelled to base their claims on Biblical revelation, rather than on the evident beauty and order in the world as we see it. But however that may be, Aristotle is concerned with the controversy between those who try to derive the higher aspects of nature, such as life and intelligence, from their simpler beginnings and those who treat them instead as first principles and as objects of Nature's striving.

Now it is striking that Aristotle suggests here that the study of nature is a partial study, a study of some limited field, rather than the comprehensive study of all that is. Why does he do this? What is there, one might well ask, apart from nature, other than conventional social arrangements and man-made intellectual constructs and artifacts, all of which are clearly derivative from and dependent on natural beings? Well, those of you who know something about Aristotle may have heard that he had a doctrine that there are eternal, unmoved beings -- divine intellects, as it seems -- beyond the realm of natural beings, which as such are all subject to motion. But even if we think we know that there are no such beings as Aristotle speaks of, must we not at least consider the alternative that there is something beyond nature? Until recently, most scientists believed that the ultimate sources of things were natural, the natural elements and their subatomic parts. But it was merely a hypothesis that these elements were the permanent building blocks of everything else, and today we are told instead that even these are not permanent, but that they emerged some billions of years ago as a result of the Big Bang. And to the question of what there was that preceded the Big Bang, for the most part we are told that there is no point even in asking. But how can we not ask about this? Was it nature in another form, a form that differs from nature as we know it now solely or chiefly in its inaccessibility to our measurements, or is the term "nature" itself inadequate in relation to that hypothesized state of affairs? And if this Big Bang resulted from something radically different from anything natural -- something more spontaneous, perhaps -- wouldn't we have to acknowledge that the study of nature is only a part of the inquiry into all that was, is, and will be? So maybe even those of us who are inclined to believe whatever we are told by modern science ought to accept Aristotle's suggestion that there is a realm beyond the natural. I'm not sure. But what is clear, I think, is that

there is a question, to which we don't with certainty know the answer, of whether there is in fact any such realm.

As its title already indicates, Aristotle's main theme in The Parts of Animals is not even nature as a whole, but rather animal nature. Accordingly, this opening chapter is primarily concerned with the proper manner of discussing this subject. After an initial question that suggests in passing that the human race has more in common with the other animals than we might like to believe, Aristotle turns to the question of the proper order of treating the observable facts of animal nature in relation to their causes. Should the student of nature first examine these facts, or the appearances, as he calls them, and only then and on that basis discuss their causes, or should he proceed in some other way? Presumably, among such other ways is the method of the geometers, who begin instead from the causes (i.e., the definitions and the axioms), on the basis of which they then derive the remaining facts. And Aristotle will soon decide against this geometric or deductive method, appropriate only to a subject whose first principles are fully clear to us, recommending instead that we begin from the more readily knowable appearances and try to ascend from them subsequently to their causes. But he doesn't give this answer at once, for reasons that I will try to explain when I come to comment on that later passage. For now, he turns in particular to one of the most characteristic facts about animals, that they come into being. Reminding us that this phenomenon has at least two different types of causes, the cause for the sake of which they come into being and the cause from which the change leading up to that end originates, he says that one must determine which of these causes is naturally primary and which secondary. And to this question he gives at once a decided answer, that the primary cause is clearly the cause for the sake of which. For this cause, he says, is a rational account, and the

rational account is what comes first, both in artifacts and in naturally constituted beings. For it is on the basis of a more or less fully articulated account of health, say, or of a house, that the builder or the doctor -- i.e., the cause in the sense of the originator of change -- gives the reasons for each of the things he does and why he must do it in that way. In other words, to the question of why a house comes into being, the most revealing answer is not so much that there is a builder who constructs it, though he is of course indispensable, but rather that it comes into being in the way that it has to come into being in order to become what a house is and to provide the shelter that such a structure provides. It is only because the builder knows this cause "for the sake of which" he builds that he can appropriately set about his task of constructing the house. Now someone might well accept this account of the coming into being of a man-made product, but still deny that it is relevant to the coming into being of a living being, which is not the work of a conscious agent with an end in view. This is indeed a genuine difficulty, and in the remainder of this first chapter we will see Aristotle's response to this implicit objection. But for now he merely asserts that "the for the sake of which" and "the beautiful" are more present in the works of nature than in artifacts.

In the sequel Aristotle indicates further how the cause for the sake of which can be a cause without being consciously aimed at. I do not mean by this that he appeals to an unconscious striving in nature toward the good and the beautiful, though he doesn't deny one either. But what he speaks of is necessity, a kind of necessity that he had already referred to in saying that the builder gives the reasons why he "must" make a house in the way he does. Aristotle calls the necessity at work here "hypothetical necessity," and he says that it is present in all things that come into being (in contrast to the unqualified necessity that he says is found among eternal beings). To illustrate this

hypothetical necessity, he elaborates on his example of housebuilding, saying that on the hypothesis that there will be a house, it is necessary for there to be a certain kind of material (e.g., bricks or logs) and for this (i.e., the foundation) to come into being first, and then that, and so on and so on up until the end (i.e., the house) for the sake of which each of these factors comes into being and exists. Aristotle does not even try here to give an explanation of why the house itself should exist, and thus he can more easily add that the kind of necessity he has shown in this example is also present in natural beings. For perhaps we have no idea why there are horses, say, or donkeys. But we know that on the hypothesis that beings of these kinds are to exist, they must have certain definite parts and have come into being in certain definite ways. Thus, in the case of a horse, for instance, we know that since it has been born alive, it must have had an umbilical cord or some equivalent means of receiving nourishment in its mother's womb. Similarly, we know that since it grazes from a time not too long after its birth, it must have the appropriate internal organs for assimilating this solid nourishment to its own form. Such intelligible necessities are of the same sort as those to which a builder must conform in building a house. There is, however, as Aristotle indicates, also a difference in the way that these necessities are present, and are known to be present, in physics, on the one hand, and in the arts and crafts, on the other. For physics, like any other theoretical pursuit, is concerned with beings that exist in fact, independently of its own activity, whereas the arts and crafts begin their thinking from the mere conception of a being that is not yet real. But despite this difference, it remains the case that in both cases we know that since the completed being is of a certain sort, it cannot exist without certain definite parts and without there being certain definite antecedents, whereas we don't know what, if anything, follows necessarily from those antecedents themselves.

Now that we begin from the mere hypothesis, or the mere fact, rather, that animals exist is of course a limit to our understanding of them. And Aristotle indicates how this limit could be at least partially overcome, namely, if it were possible for us to continue the chain of our hypothetical reasoning infinitely far back in time. We could do this if we could demonstrate, for instance, that the seed that was known to be necessary for the coming into being of a particular animal could only have come from an animal that was exactly similar, and so on and so on. For in that case the very fact that such an animal exists today would prove that it must have always existed, and this could hardly have been an accident, but instead would have to be the result of an eternal necessity for it to exist, and we could know this even if we could not know the ultimate grounds of that necessity. But the truth is, as Aristotle knew even without the fossil evidence that we have now, that there is no possible way of demonstrating from the existence of an animal today that it must necessarily have existed throughout all time. And thus our knowledge of the necessities that are inherent in animal nature must remain limited by our ignorance regarding the reasons for the existence of the animals themselves.

Aristotle continues by raising the question of whether the student of nature should focus attention on how each animal naturally comes into being, as his philosophic predecessors had done, or whether he should focus more on the way it is [once it is fully developed]. In response to this question, he gives what he indicates is also the answer I've already mentioned to an earlier question, namely, that one must first grasp the appearances regarding each kind, and then and on that basis speak of their causes and of coming into being. Now it is not immediately clear how this statement that one should begin one's account from the appearances is an appropriate response to the question of whether one should focus more altogether on the way the animal comes into being or on

the way it is. But the start of an explanation can be seen from the fact that Aristotle distinguishes here between the appearances in regard to the various animals and their coming into being. Thus, what he means here by the appearances are those that are seen in the full-grown animal, and so he is answering his present question at least to this extent, of saying that at the beginning of one's account, one should speak of the way the animal is rather than of how it comes into being. But more than that, when he goes on to say that one should next discuss the causes of the appearances and also coming into being, he is suggesting that coming into being belongs together with those causes, but only as a kind of appendage to them. For as he goes on to explain, it is more the case also in housebuilding that it is because the house, or the form of the house, has the character that it does that it comes into being in the way it does, rather than vice versa. And in the present context, this emphasis on what Aristotle now calls the form of a being implies that not only in presenting the appearances, but also in discussing their causes, one should focus more on how the being is once it has completed its development than on how it comes into being. And so he has indeed been addressing his immediate question as to which of these two themes should be the primary focus of the student of nature. Moreover, we can now also see why he couldn't earlier present his answer to the question of whether to begin one's account with the appearances or with their causes. For he hadn't yet prepared the ground for distinguishing among the appearances and for arguing that it is those that belong to an animal in its maturity that one should begin from in order to bring to light the most important causes.

But in denying that coming into being is the most important cause of the appearances regarding animals, Aristotle admits implicitly that it is to some extent a cause. Indeed it is largely, I think, in order to do justice to the significance of this cause that he

has even asked about it here. For earlier he had said that the builder can explain in terms of the rational account, or in other words the form, of a house why he must do "each" of the things that he does in the process of building. But in this new section he says merely that it is "more" the case that the house comes into being as it does because of its form than vice versa. And in keeping with this acknowledgment of the causal importance of coming into being, the criticism that he goes on to make of Empedocles, who apparently treated this as the primary cause, is a qualified one. For he says that Empedocles spoke incorrectly in saying that "many" attributes belong to animals because it turned out that way in their coming into being, but this statement does not deny that some features can be best explained in that way. Thus, for instance, Empedocles tried to explain the vertebrae in animals that have them on the grounds of the backbone becoming twisted in its development. By contrast, Aristotle will suggest that they are necessary for animals with bony skeletons for the sake of the flexibility of movement that they need to survive. However, he does not say that even the vertebrae can be wholly explained in this way, and thus he allows that an Empedoclean account is perhaps the only way to explain some of their features, as for instance, their color or their precise number.

Now Aristotle also criticizes Empedocles in a way that would seem to negate even this partial concession, saying that if he had looked further back in time, he would have seen that the vertebrate animal had a vertebrate parent, and that it is because of the character of the parent that the offspring comes into being as it does. According to this argument, the form of a natural being pre-exists it, since it exists in the parent, and it is not merely a limiting condition on what the being is like and on how it comes into being, but because of its role in initiating that coming into being, it is more completely determi-

native. And yet Aristotle does not say here that it is necessary for an animal to have a similar parent (as he does say that it is necessary for it to have come from an appropriate seed), and so it is not clear that this attempt to outdo Empedocles on his own terms can succeed. For Empedocles would have replied that the animal species are not permanent, so that their first members must have emerged from something other than similar parents, and thus their coming into being is ultimately the primary cause. And rather than respond to such an assertion with what would have to be a mere counter-assertion of his own, Aristotle returns to the aspect of his argument that does not rely on the claim that a similar parent was responsible for the way that the offspring comes into being. He does this by way of extending his account from those animals that do have parents to those that, according to a widespread ancient error, which Aristotle himself seems to have shared, emerge spontaneously from the elements. (That Aristotle was apparently wrong, by the way, about the generation of clams and mussels and the like is less important for our purposes than that he acknowledged, as did Empedocles, and as modern science must as well, that it is in principle possible for a life to emerge from non-living precursors.) Now what he says here is that the causality in the case of spontaneously generated animals is similar to that which is at work in the case of those with parents, as well as of artifacts. For whether or not the form of the new being has already existed in another being, as it does in the parents of the more normal animals and in the mind of the craftsman who produces an artifact, the decisive point in all these cases is that this form sets knowable limits that help determine what the being can be like. Aristotle illustrates his point with the example of man, saying that since this, which we can call the form, is [what it is] to be a human being, therefore he has these parts, [not because his parents already had the same parts, but] because it is not possible [for a human

being] to be without them. To spell out this suggestion we might say, for instance, that since a human being is characterized at least partially by the power of thought, a man must also possess animal senses, or the initial openness to the world that only sense perception can provide, in order to have something to think about. Now in this connection, Aristotle makes explicit what his earlier argument had only suggested -- but which is implied by his retreat from appealing to the similarity of the parent -- namely, that the causality, or necessity, that depends on an animal's form may not be fully responsible for all of that animal's attributes. Thus, he continues, if one is unable to give the kind of account he has just recommended (in the case of some of the parts of a human being), one should come as close to it as possible, either by characterizing more loosely the kind of parts that one says are necessary, or else by asserting that it is at least a good thing for a man to have them. Thus, for instance, though it may be impossible to explain why a rational animal has to have blood, it is clear at least that he needs some such fluid in order to distribute the digested nourishment throughout the body. And in the case of minor parts like toenails or fingernails, they are clearly useful for us to have, even if the protection that they provide is not simply necessary. Aristotle concludes this response to Empedocles by repeating what he had said earlier, that the character of the mature being also makes necessary the manner of its coming into being, as for instance the order in which its parts emerge. He doesn't ask here explicitly whether the character of the being is <u>fully</u> responsible for the manner in which it comes into being, but in the light of what he has just indicated about its possibly limited responsibility for the animal's parts, it is likely that in this case too he would acknowledge the possibility of a limited role.

At this point Aristotle turns to a more general confrontation with his philosophic predecessors. These early philosophers had offered accounts not only of the coming into

being of the various animals, but also of the coming into being of the world itself. And since his own primary approach to the study of animals has now shown itself to be incomplete, and also since he has made no claims about the causes of the world as a whole, it makes sense for him to consider the doctrines of those who did claim to have brought to light the fundamental necessity underlying all things. For in addition to the great intrinsic importance of evaluating their claims, the question of animal nature can hardly be isolated from that of the larger whole in which we live. Now what Aristotle's predecessors investigated was in the first place the character of the material principle or cause, and also how, or with what as a mover, the whole world comes into being from it. The underlying material, according to their doctrines, has a certain kind of nature from necessity, as for instance fire is both hot and light, and earth is both cold and heavy. And the cause that set these materials in motion so as to bring the world as we know it into being was said to be either strife (i.e., repulsion) or love (i.e., attraction) or (divine) intelligence or chance. From similar material principles -- in particular, from air and water and such (inanimate) elements of bodies -- these philosophers also attempted to account for the coming into being of the animals and plants. Now Aristotle objects in the first place that these doctrines are not adequate even to account for the parts of animals. For the stomach and nostrils, for instance, are more than just cavities within the body, but they have a certain character and power in accordance with which they are what they are. Thus, even if one happened to be correct about the bodily elements from which they are constituted, as well as about how they first emerged from those elements, one would not yet have explained them, or their character in a living being. Aristotle adds that if we were giving an account of an artifact, we would also try more to determine its form than its material. Indeed, the material in the fullest sense is the material

as already fashioned so as to constitute the being in question -- the frame of a bed, for instance, rather than mere logs -- so that to account even for this material, one would have to speak of the shape and the form of the completed product.

Against the view, however, that an animal's form is a more important cause than its material, the philosopher Democritus had apparently objected that the forms of the animals and of their parts are nothing more than their shapes and colors. By this he presumably did not mean to deny that there are the necessities that Aristotle has been pointing to, those that follow, for instance, from the character of a rational animal. But he seems to have regarded all such necessities as being relatively insignificant, since he thought that the living beings themselves are merely temporary and accidental arrangements of the only truly necessary beings, or the bodily elements. Accordingly, when he spoke of the form, whether of an animal or of one of its parts, he meant nothing more than the shape and color by which it is recognized. But Aristotle objects that a man who has died still has the same form in the sense of shape and yet is not a man, just as a bronze or wooden object in the shape of a hand is not a hand, since it will not be able to do the work of one. Thus, a Democritean account of the coming into being of a hand or of some other such part, an account that considers these as what they are only in virtue of the shapes and colors taken on by some aggregate of inanimate bodies, is like an account of the production of a wooden hand, rather than of the coming into being of a living organ. Indeed, Aristotle continues, it is even inferior to such an account, since a woodworker could give the cause for the sake of which he took the steps that produced the hand, whereas Democritus has no such account to offer. Now Democritus might have responded that this is precisely the difference between artifacts and natural beings, that artifacts are produced by an intelligent cause on the basis of an understanding of

their form, whereas the form of natural beings plays no such directive role. But though this response would be well taken, Aristotle's main objection still stands, that a Democritean, or materialistic, account of animals and of their parts is unable to explain their capacity to perform their functions. (Even today, by the way, to the best of my knowledge, despite the infinitely greater sophistication of contemporary natural science, no one has come even close to explaining the capacity of a living hand, for instance, to serve as an organ of the sense of touch.) Now in making this criticism of his predecessors' account of animals and their parts, Aristotle is also implicitly criticizing their account of the material substrate of the world as a whole. For if one cannot explain the powers of animals and their parts on the basis of any known properties of inanimate bodies, there are no adequate grounds for the philosophers' confidence that they have understood, in these bodies, the ultimate substrate of all that is. And thus Democritus' dismissive treatment of the question of animal form, based as it is on his false confidence that he had understood that ultimate substrate, does not make sense.

Aristotle goes on to say, as he had said already, that the student of nature must speak of the form, or of that in accordance with which an animal is such as it is. He adds that one must say both what this (form) is and of what sort it is, and also that one must say this about each of its parts. And in keeping with his recent criticism of the materialism of his predecessors, he now suggests for the first time that this form may be soul or a part of soul. Or more cautiously, since it seems extreme to say that what it is to be a given animal does not include the animal's body, and since it is even hard to know what soul could be other than that whole comprised of the powers of a living body, Aristotle adds that the form of an animal may be better spoken of not as soul, but as inseparably bound up with soul. And if these things are so, he continues, the student of nature

would have to know about soul, if not all of it, at least that part according to which the animal is such as it is. He must know what soul, or that part of soul, is itself and also about the attributes that belong to the animal in accordance with this aspect of its being, especially since nature is spoken of, and is, in a twofold manner, both in the sense of the material of a natural being and in the sense of its being as the being it is.

Aristotle does not limit himself to speaking of soul as the form, or as inseparably bound up with the form, of an animal and as the key aspect of its being. He also says that the animal's being (or its beingness, if you'll allow me this word) is both the principle that sets it in motion and the culminating end of its coming into being; and he seems to identify beingness, in this sense in which it is both the moving principle and the culminating end, with all or part of the soul. So for this reason as well, he says, the student of nature would have to speak of soul more than of material, inasmuch as it is more because of the soul that the material is nature (i.e., constitutive of the various kinds of animals) than that the soul is nature (in the sense of form) because of the material. Now Aristotle's argument that the study of nature must be concerned with the animal soul, especially now that he has characterized soul as being both moving principle and end, leads him to ask whether the study of nature must be concerned with all aspects of soul or only with some. For if its domain extends to all aspects of soul, including the mind, there will be no room for a philosophy higher than the science of nature. Aristotle makes this claim on the premise that the study of mind must at the same time study the mind's objects, the knowable forms; and he suggested elsewhere that the science of knowable forms culminated in the highest of all sciences, that of thought thinking itself or of the eternal God at the origin of all being. However, early in my talk I referred to the fact that according to Aristotelian doctrine, the science of God

and of the other eternal beings transcended the study of nature, which is concerned with changeable beings. And so it would seem that he must also have excluded from the study of nature the human mind, if it is an aspect of soul that comes into its own in the act of awareness of those eternal beings. Now as I report this train of thought, I am of course aware that the Aristotelian notion of a scientific study of God seems incredible to most people today, whether they believe in God or not. But I would suggest that one reason for at least considering it as a serious alternative is that the notion that there is an intelligible mind at the origin of all being could, if true, provide assurance that the world itself is also intelligible, and that what we speak of as understanding is not merely an account of what appears to us as a result of our human-colored intellectual glasses. And even if that theology is not true, it serves to remind us of this fundamental question of whether genuine knowledge is possible, and this question, at any rate, is one that clearly does transcend the study of nature, which from the beginning takes the possibility of knowledge for granted. At this stage of his discussion, however, Aristotle has not yet decided the question of whether the mind is a subject belonging to the study of nature. He decides this question -- in the negative -- only after making the further suggestion that the mind, unlike the other parts of the soul, is not a principle from which motion or change begins. Even the motion from place to place, he argues, is not attributable to mind, on the grounds that unintelligent animals are no less capable of such motion than we are. And so it is clear, he says, that not all soul is a proper subject for the study of nature, since only part of it is nature. It is worth stressing, I think, that this conclusion depends on the premise that the soul by itself is an initiating principle of motion, and this premise can well be questioned. But however that may be, Aristotle supports his conclusion that the mind is not a subject belonging to the study of nature by saying that

it is not possible for this study to contemplate any of the beings that exist by abstraction. This phrase "the beings that exist by abstraction" refers to the mathematical objects, such as triangles or circles, which in their purity exist only as a result of intellectual abstraction, i.e., a disregarding of the imperfections of triangular or circular looking bodies. And Aristotle's reason for excluding these mathematical objects from the study of nature is that nature does all things for the sake of something, whereas the mathematicals are presumably not as they are for any such reason. Now in the light of what Aristotle regards as the abstract or derivative character of the mathematicals, their exclusion from the study of nature does not seem to be a weighty argument for also excluding mind in general. But that aside, the claim that nature does all things for the sake of something needs to be clarified.

It appears at first that Aristotle is still treating the end of natural motions as an initiating principle of these motions, a productive or moving cause, not only of the coming into being of animals, but also of the motions of the heaven or world, including the motion of its generation if the heaven was generated. For after saying that the end that appears in "the things themselves" is a principle that we have from the all (which implies that it exists, as heat and cold do, even apart from us living beings), he adds that it is accordingly more plausible that the heaven has come into being, if it did, and that it persists in being by such a cause, i.e., for the sake of such an end, than that the mortal animals do. In keeping with this, he suggests puzzlement at those who say that the heaven, in which nothing at all appears from luck and disorder, was constituted from luck or chance. And since normally chance is contrasted with a moving cause in which the end plays a guiding role, Aristotle's suggestion here that natural processes, and especially the heavenly ones, are not from chance, looks like a statement that their end,

or that for the sake of which they take place, is at least in some sense a productive or moving cause. It makes sense, moreover, that he couples this suggestion about the end as a moving cause with an argument that such causality is found also in the heavenly motions, since it is very hard to see how the ends, in the case of the various animals, could also play a productive role in their generation and their growth if the whole visible world to which animals belong has a merely chance origin. And yet at this point Aristotle surprises us with an account of what he means by the phrase "for the sake of something" that calls this entire train of interpretation into doubt. For he says that we say "this is for the sake of this" everywhere where there appears some end which motion reaches if there is no impediment. And motion for the sake of something in the sense defined here proceeds toward an end, or a result, that may not have played any productive role at all. Moreover, the obvious fact that there is motion for the sake of something, in the sense defined here, in the case of animal development toward maturity helps to remind us that the heavenly motions have no such obvious end, and thus to raise doubts as to Aristotle's claim that nature does <u>all</u> things for the sake of something. And yet Aristotle does not simply dismiss the claim that the end of natural motion, at least in cases where there is an end, is also a productive cause. For after using his account of the phrase "for the sake of something" to make it clear that there is indeed an end for the sake of which animal development takes place, he adds that we call this development "nature"; and he supports this use of the term "nature" (φύσιν) by noting that an animal grows (φύεται) from a definite seed, which is its productive principle. And he further notes that this seed had a definite antecedent, the parent. Accordingly, one could still think that the form common to offspring and parent is both the end and the ultimate productive cause of an animal's coming into being. However, Aristotle

again proceeds to undermine this thought, for the only example that he gives here of a parent as productive cause is that of a horse which fathers a mule. And since in this case the offspring is not even the same in form as his parent, or since the end toward which the mule develops does not even exist before the mule itself, there is no basis for arguing that this end is a productive cause of it. Accordingly, it need not surprise us that Aristotle now concludes that there are two causes, or two senses of cause, the for the sake of which and the from necessity. For many things, he adds, come into being because of necessity. Not only, in other words, does he acknowledge that the cause for the sake of which must be supplemented by another kind of cause in order to account for the animal's coming into being, but by calling this other cause "necessity" (and by implicitly excluding any other kind of productive cause), he implies that the cause for the sake of which is not even a guiding factor in its productive action.

In order to clarify further this supplement to the cause for the sake of which, Aristotle says that someone might perhaps wonder what kind of necessity is meant by those who speak of the cause from necessity. After rejecting as inapplicable to the normal development of animals both unconditional, or exceptionless, necessity and the necessity of violence, he says that among generated beings there is a third kind, the one which he has already spoken of as hypothetical necessity, or the necessity of that without which something cannot be. He again illustrates this kind of necessity with the example of an artifact, in this case an ax which must necessarily be hard on the hypothesis that it be able to split wood, and which must necessarily be of bronze or iron if it is to be hard. He then adds that since the animal body is itself also a tool, its character and its materials (i.e., its parts) must necessarily be as they are if those activities for the sake of which it exists are to be carried out. Now this account, which we have heard before, is clear

enough as far as it goes. And yet we should note that what Aristotle says here about hypothetical necessity was in answer to the question of what kind of necessity is meant by those who spoke of the cause from necessity, and does not even claim to be a full account of this cause itself. Thus, we should perhaps not be too surprised that at the end of this chapter, Aristotle refers to an additional kind of necessity, one that must also be included in any account of animal life. He does this in the course of illustrating how an account of animal functions is to include both the cause for the sake of which and the cause from necessity. Using breathing as his example, he says one must say that it is for the sake of this (cooling the blood, in his view), and that this [cooling] comes about because of these things (primarily, of course, the lungs) from necessity. And necessity, he goes on to say, sometimes means that if that for the sake of which is to be, it is necessary to have these things, but sometimes also means that "they" (whatever they might be) are in such a condition and of such a nature. Now the last part of this claim is illustrated by his saying that "it is necessary for the hot [breath] to go out and to come in again when it meets resistance and for the air to rush in; for this is already necessary." In other words, hot breath and the cooler external air move in the way they do, thereby also setting the lungs and the other parts in motion, by a necessity of their nature. Now we need not insist on the details of this sketchy account of respiration, an account that is far less clear than the one that Aristotle gives in his work On Breathing. But what is important is that he supplements what he has called hypothetical necessity with a necessity of another kind, the necessity for the substances from which animal life is constituted to act and to be acted upon in accord with their nature. Thus, it is necessary for air, for instance, to expand when it is heated, not for the sake of anything, nor even merely as a presupposition of breathing, but simply because to do so is the nature of air.

Aristotle's example here of the necessity that is simply bound up with the nature of something, or that is indifferent to the attainment of any end, involves only the nature of air insofar as it is relevant to the process of breathing. But the scope of this kind of necessity is considerably more far-reaching than it might seem from this one example alone. For we have already seen that, among natural beings, the end as such is not a productive factor, and that when Aristotle says that the two kinds of causes are the cause for the sake of which and the cause from necessity, he is implicitly including the productive cause under the rubric of necessity. Thus, though there is no unconditional necessity for a seed to develop normally, it does so necessarily whenever circumstances are favorable, not because of any influence on the part of the end toward which it tends, but simply because it is the nature of a seed to do so. Now these necessary productive motions become more fully articulated as a being develops, and so we should not be surprised to learn that there are many passages in The Parts of Animals where Aristotle explicitly couples his account of that for the sake of which an organ exists with a discussion of what he calls the necessary cause, or of those motions inherent in the natures of the various substances that make up the animal that just happen to result in what proves to be a serviceable organ. Indeed, he even says that many features of animals are to be explained solely by such necessities (677a17-19), since they serve no useful function at all, or are even harmful to the animal possessing them.

The scope of this kind of necessity that follows simply from the nature of something, and that is indifferent to the attainment of any end, is not exhausted, however, by such examples of productive or moving causes. A sign that this is so can be seen from the comments that Aristotle makes here with regard to his predecessors. He has just concluded that one ought in the best case to hit upon both manners of cause, the cause for

the sake of which and the cause from necessity, and that all those who do not speak in this way say practically nothing about nature. For nature, he explains, is more a principle than the material is. Now by the term "nature," in this context, Aristotle apparently means the cause for the sake of which, which he seems to suggest is equivalent to the form of a being as opposed to its matter. And yet when he proceeds to say that Empedocles had said a little about this principle, he refers only to the mathematical ratio that constitutes the nature of bone, and he says nothing at all about that for the sake of which bone exists. He adds that Democritus was the first thinker to touch upon this principle, which he also calls the what it is to be or the beingness of a kind of being, but here too he says nothing about any cause for the sake of which. In fact, his reference seems to be merely to Democritus' suggestion that certain atoms are hotter than others, not because of any difference in their substance, but because of their shape (cf. Metaphysics 1078b17-21; On the Soul 405a8-12). Thus, Aristotle counters our expectation that the being of a thing, or its form, would be treated as simply identical to the cause for the sake of which. Indeed, he even suggests that it is in a certain sense opposed to it. For just as it is by necessity that a certain ratio constitutes bone, quite indifferently to any end that the bone might serve, so in general the form of a being may manifest its causal power as a necessity that is indifferent to any ends or wishes. Now I am unable to say much here in elaboration of this last suggestion, but let me at least refer to a passage from later in The Parts of Animals. Aristotle says there that "it is better, where possible, not to have the same organ for dissimilar uses .... For wherever it is possible to employ two organs for two functions and for them not to get in one another's way, nature is accustomed to do nothing like the coppersmith who for cheapness' sake makes a combination spit and lamp-stand. But where this is not possible, it uses the same organ

for several functions" (683a19-26). And yet Aristotle also tells us of many instances in which animal organs do serve several functions, and so it turns out to be quite common that it is impossible to have the better arrangement of a separate organ for each. But why is this impossible? Well, there is one case that Aristotle mentions in this passage from which I quoted, and what he says here is that insects with only two wings are not strong enough to deliver a forceful blow with a sting located in the rear, so that their sting must necessarily be associated with their tongue. In other words, it is because these insects are the kind of beings they are that they cannot have a sting wholly distinct from their tongue. And more generally, it is the nature, or the form, of the various animals that shows its power as a kind of necessity that prevents the attainment of what are in principle desirable ends. This is not to say that desirable ends do not also belong to an animal's form, but Aristotle's suggestion would be that even in these cases their existence does not result from their being desirable.

Now Aristotle's suggestions about the scope and character of what he calls here the cause from necessity do not even pretend to amount to a full account of why animals develop in the way they do. And yet since the end, as it has also appeared, is not a productive or even a guiding cause, it seems that Aristotle must himself acknowledge a profound ignorance about the sources of these beings, and hence also about the sources of the world within which they exist. Now from my reading of Plato's dialogues, I learned that Socrates was, if not the first philosopher, at least one of the first philosophers to fully appreciate the depth of our ignorance about the ultimate roots of things. For this reason, he was among the first philosophers to turn away from the direct inquiry into these causes and to focus instead, in what he called his "second sailing," on the question of <u>what</u> the beings as we know them are. And it was from Socrates, I think, and

his pupil Plato that Aristotle learned that despite our ignorance as to why the various beings exist, it is still fruitful to study the necessities inherent in what they are, or the ways in which certain of their features make it intelligible why they must also have certain others. For some reason, Aristotle does not acknowledge here the full extent of his debt to Socrates. But he does say that the crucial inquiry, or the inquiry into the being of things, which had been neglected by the early philosophers in their naive pursuit of ultimate causes, increased in the time of Socrates. Now he also criticizes the philosophers of that time for turning away from the inquiry into nature, in favor of the study of useful virtue and political science. However, he does not say of Socrates himself, as distinct from his followers or his contemporaries, that he neglected the inquiry into nature, and in fact he did not. But it was indeed Socrates who compelled philosophers, including Aristotle among others, to investigate moral and political virtue; and I can only suggest here as a bald assertion -- an assertion with which I conclude -- that Socrates' concern with the political realm was closely connected with his awareness of his ignorance of the ultimate sources of what we call nature.