

PHYSICS

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BOOK I

184a10-184a16

§ 1 · When the objects of an inquiry, in any department, have principles, causes, or elements, it is through acquaintance with these that knowledge and understanding is attained. For we do not think that we know a thing until we are acquainted with its primary causes or first principles, and have carried our analysis as far as its elements. Plainly, therefore, in the science of nature too our first task will be to try to determine what relates to its principles.

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The natural way of doing this is to start from the things which are more knowable and clear to us and proceed towards those which are clearer and more knowable by nature; for the same things are not knowable relatively to us and knowable without qualification. So we must follow this method and advance from what is more obscure by nature, but clearer to us, towards what is more clear and more knowable by nature.

184a22-184b14

Now what is to us plain and clear at first is rather confused masses, the elements and principles of which become known to us later by analysis. Thus we must advance from universals to particulars; for it is a whole that is more knowable to sense-perception, and a universal is a kind of whole, comprehending many things within it, like parts. Much the same thing happens in the relation of the

²TEXT: W. D. Ross, OCT, Oxford, 1950

name to the formula. A name, e.g. ‘circle’, means vaguely a sort of whole: its definition analyses this into particulars. Similarly a child begins by calling all men father, and all women mother, but later on distinguishes each of them.

§ 2 · The principles in question must be either one or more than one. If one, it must be either motionless, as Parmenides and Melissus assert, or in motion, as the physicists hold, some declaring air to be the first principle, others water. If more than one, then either a finite or an infinite plurality. If finite (but more than one), then either two or three or four or some other number. If infinite, then either as Democritus believed one in kind, but differing in shape; or different in kind and even contrary.

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A similar inquiry is made by those who inquire into the number of existents; for they inquire whether the ultimate constituents of existing things are one or many, and if many, whether a finite or an infinite plurality. So they are inquiring whether the principle or element is one or many.

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Now to investigate whether what exists is one and motionless is not a contribution to the science of nature. For just as the geometer has nothing more to say to one who denies the principles of his science—this being a question for a different science or for one common to all—so a man investigating *principles* cannot argue with one who denies their existence. For if what exists is just one, and one in the way mentioned, there is a principle no longer, since a principle must be the principle of some thing or things.

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To inquire therefore whether what exists is one in this sense would be like arguing against any other position maintained for the sake of argument (such as the Heraclitean thesis, or such a thesis as that what exists is one man) or like refuting a merely contentious argument—a description which applies to the arguments both of Melissus and of Parmenides: their premisses are false and their conclusions do not follow. Or rather the argument of Melissus is gross and offers no difficulty at all: accept one ridiculous proposition and the rest follows—a simple enough proceeding.

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We, on the other hand, must take for granted that the things that exist by nature are, either all or some of them, in motion—which is indeed made plain by induction. Moreover, no one is bound to solve every kind of difficulty that may be raised, but only as many as are drawn falsely from the principles of the science: it is not our business to refute those that do not arise in this way; just as it is the duty of the geometer to refute the squaring of the circle by means of segments, but it is not his duty to refute Antiphon’s proof. At the same time the holders of the theory of which we are speaking do incidentally raise physical questions, though nature

185a12-185a20

is not their subject; so it will perhaps be as well to spend a few words on them, especially as the inquiry is not without scientific interest.

185a21-185a26 The most pertinent question with which to begin will be this: In what sense is it asserted that all things *are* one? For ‘is’ is used in many ways. Do they mean that all things are substance or quantities or qualities? And, further, are all things one substance—one man, one horse, or one soul—or quality and that one and the same—white or hot or something of the kind? These are all very different doctrines and all impossible to maintain.

185a27-185a28 For if *both* substance and quantity and quality are, then, whether these exist independently of each other or not, what exists will be many.

185a29-185b5 If on the other hand it is asserted that all things are quality or quantity, then, whether substance exists or not, an absurdity results, if indeed the impossible can properly be called absurd. For none of the others can exist independently except substance; for everything is predicated of substance as subject. Now Melissus says that what exists is infinite. It is then a quantity. For the infinite is in the category of quantity, whereas substance or quality or affection cannot be infinite except accidentally, that is, if at the same time they are also quantities. For to define the infinite you must use quantity in your formula, but not substance or quality. If then what exists is both substance and quantity, it is two, not one; if only substance, it is not infinite and has no magnitude; for to have that it will have to be a quantity.

185b6-185b7 Again, ‘one’ itself, no less than ‘is’, is used in many ways, so we must consider in what way the word is used when it is said that the universe is one.

185b8-185b9 Now we say that the continuous is one or that the indivisible is one, or things are said to be one, when the account of their essence is one and the same, as liquor and drink.

185b10-185b11 If their One is one in the sense of continuous, it is many; for the continuous is divisible *ad infinitum*.

185b12-185b17 There is, indeed, a difficulty about part and whole, perhaps not relevant to the present argument, yet deserving consideration on its own account—namely, whether the part and the whole are one or more than one, and in what way they can be one or many, and, if they are more than one, in what way they are more than one. (Similarly with the parts of wholes which are not continuous.) Further, if each of the two parts is indivisibly one with the whole, the difficulty arises that they will be indivisibly one with each other also.

185b17-185b18 But to proceed: If their One is one as indivisible, nothing will have quantity or quality, and so what exists will not be infinite, as Melissus says—nor, indeed, limited, as Parmenides says; for though the limit is indivisible, the limited is not.

But if all things are one in the sense of having the same definition, like raiment and dress, then it turns out that they are maintaining the Heraclitean doctrine, for it will be the same thing to be good and to be bad, and to be good and to be not good, and so the same thing will be good and not good, and man and horse; in fact, their view will be, not that all things are one, but that they are nothing; and that to be of such-and-such a quality is the same as to be of such-and-such a quantity.

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Even the more recent of the ancient thinkers were in a pother lest the same thing should turn out in their hands both one and many. So some, like Lycophron, were led to omit 'is', others to change the mode of expression and say 'the man has been whitened' instead of 'is white', and 'walks' instead of 'is walking', for fear that if they added the word 'is' they should be making the one to *be* many—as if 'one' and 'is' were always used in one and the same way. What is may be many either in definition (for example to be white is one thing, to be musical another, yet the same thing may be both, so the one is many) or by division, as the whole and its parts. On this point, indeed, they were already getting into difficulties and admitted that the one was many—as if there was any difficulty about the same thing being both one and many, provided that these are not opposites; for what is one may be either potentially one or actually one.

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§ 3 · If, then, we approach the thesis in this way it seems impossible for all things to be one. Further, the arguments they use to prove their position are not difficult to expose. For both of them reason contentiously—I mean both Melissus and Parmenides. [Their premisses are false and their conclusions do not follow. Or rather the argument of Melissus is gross and offers no difficulty at all: admit one ridiculous proposition and the rest follows—a simple enough proceeding.]³

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The fallacy of Melissus is obvious. For he supposes that the assumption 'what has come into being always has a beginning' justifies the assumption 'what has not come into being has no beginning'. Then this also is absurd, that in every case there should be a beginning of the *thing*—not of the time and not only in the case of coming to be *simpliciter* but also in the case of qualitative change—as if change never took place all at once. Again, does it follow that what is, if one, is motionless? Why should it not move, the whole of it within itself, as parts of it do which are unities, e.g. this water? Again, why is qualitative change impossible? But, further, what is cannot be one in form, though it may be in what it is made of. (Even some of the physicists hold it to be one in the latter way, though not in the former.) Man obviously differs from horse in form, and contraries from each other.

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³The bracketed words are probably wrongly inserted from 185a9-12.

186a22-186a32

The same kind of argument holds good against Parmenides also, besides any that may apply specially to his view: the answer to him being that *this* is not true and *that* does not follow. His assumption that ‘is’ is used in a single way only is false, because it is used in several. His conclusion does not follow, because if we take only white things, and if ‘white’ has a single meaning, none the less what is white will be many and not one. For what is white will not be one either in the sense that it is continuous or in the sense that it must be defined in only one way. Whiteness will be different from what has whiteness. Nor does this mean that there is anything that can exist separately, over and above what is white. For whiteness and that which is white differ in definition, not in the sense that they are things which can exist apart from each other. But Parmenides had not come in sight of this distinction.

186a33-186b3

It is necessary for him, then, to assume not only that ‘is’ has the same meaning, of whatever it is predicated, but further that it means what *just is* and what is *just one*. For an attribute is predicated of some subject, so that the subject to which ‘is’ is attributed will not be, as it is something different from being. Something, therefore, which is not will be. Hence what just is will not belong to anything else. For the subject cannot be a *being*, unless ‘is’ means several things, in such a way that each *is* something. But *ex hypothesi* ‘is’ means only one thing.

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If, then, what just is is not attributed to anything, but other things are attributed to it, how does what just is mean what is rather than what is not? For suppose that what just is is also white, and that being white is not what just is (for being cannot even be attributed to white, since nothing is which is not what just is), it follows that what is white is not—and that not in the sense of not being something or other, but in the sense that it is not at all. Hence what just is is not; for it is true to say that it is white, and we found this to mean what is not. So ‘white’ must also mean what just is; and then ‘is’ has more than one meaning.

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In particular, then, what is will not have magnitude, if it is what just is. For each of the two parts must *be* in a different way.

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What just is is plainly divisible into other things which just are, if we consider the mere nature of a definition. For instance, if man is, what just is, animal and biped must also be what just is. For if not, they must be attributes—and if attributes, attributes either of man or of some other subject. But neither is possible.

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For an attribute is either that which may or may not belong to the subject or that in whose definition the subject of which it is an attribute is involved. Thus sitting is an example of a separable attribute, while snubness contains the definition of nose, to which we attribute snubness. Further, the definition of the whole is not contained in the definitions of the contents or elements of the definitory formula;

that of man for instance in biped, or that of white man in white. If then this is so, and if biped is supposed to be an attribute of man, it must be either separable, so that man might possibly not be biped, or the definition of man must come into the definition of biped—which is impossible, as the converse is the case.

If, on the other hand, we suppose that biped and animal are attributes not of man but of something else, and are not each of them what just is, then man too will be an attribute of something else. But we must assume that what just is is *not* the attribute of anything, and that the subject of which both biped and animal are predicated is the subject also of the complex. Are we then to say that the universe is composed of indivisibles?

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Some thinkers did, in point of fact, give way to both arguments. To the argument that all things are one if being means one thing, they conceded that what is not is; to that from bisection, they yielded by positing atomic magnitudes. But obviously it is not true that if being means one thing, and nothing can at the same time both be and not be, there will be nothing which is not; for even if what is not cannot *be* without qualification, there is no reason why it should not be something or other. To say that all things will be one, if there is nothing besides what is itself, is absurd. For who understands ‘what is itself’ to be anything but some particular thing? But if this is so, there is still nothing to prevent there being many beings, as has been said.

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It is, then, clearly impossible for what is to be one in this sense.

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§ 4 · The physicists on the other hand have two modes of explanation.

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The first set make the underlying body one—either one of the three⁴ or something else which is denser than fire and rarer than air—then generate everything else from this, and obtain multiplicity by condensation and rarefaction. (Now these are contraries, which may be generalized into excess and defect. Compare Plato’s ‘Great and Small’—except that he makes these his matter, the one his form, while the others treat the one which underlies as matter and the contraries as differentiae, i.e. forms.)

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The second set assert that the contrarieties are contained in the one and emerge from it by segregation, for example Anaximander and also all those who assert that what is is one and many, like Empedocles and Anaxagoras; for they too produce other things from their mixture by segregation. These differ, however, from each other in that the former imagines a cycle of such changes, the latter a single series. Anaxagoras again made both his homogeneous substances and his contraries infinite, whereas Empedocles posits only the so-called elements.

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⁴I.e. water, air, fire.

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The theory of Anaxagoras that the principles are infinite was probably due to his acceptance of the common opinion of the physicists that nothing comes into being from what is not. (For this is the reason why they use the phrase ‘all things were together’ and the coming into being of such and such a kind of thing is reduced to change of quality, while some spoke of combination and separation.) Moreover, the fact that the contraries come into being from each other led them to the conclusion. The one, they reasoned, must have already existed in the other; for since everything that comes into being must arise either from what is or from what is not, and it is impossible for it to arise from what is not (on this point all the physicists agree), they thought that the truth of the alternative necessarily followed, namely that things come into being out of existent things, i.e. out of things already present, but imperceptible to our senses because of the smallness of their bulk. So they assert that everything has been mixed in everything, because they saw everything arising out of everything. But things, as they say, appear different from one another and receive different names according to what is numerically predominant among the innumerable constituents of the mixture. For nothing, they say, is purely and entirely white or black or sweet, or bone or flesh, but the nature of a thing is held to be that of which it contains the most.

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Now the infinite *qua* infinite is unknowable, so that what is infinite in multitude or size is unknowable in quantity, and what is infinite in variety of kind is unknowable in quality. But the principles in question are infinite both in multitude and in kind. Therefore it is impossible to know things which are composed of them; for it is when we know the nature and quantity of its components that we suppose we know a complex.

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Further, if the parts of a whole may be indefinitely big or small (by parts I mean components into which a whole can be divided and which are actually present in it), it is necessary that the whole thing itself may also be of any size. Clearly, therefore, if it is impossible for an animal or plant to be indefinitely big or small, neither can its parts be such, or the whole will be the same. But flesh, bone, and the like are the parts of animals, and the fruits are the parts of plants. Hence it is obvious that neither flesh, bone, nor any such thing can be of indefinite size in the direction either of the greater or of the less.

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Again, according to the theory all such things are already present in one another and do not come into being but are constituents which are separated out, and a thing receives its designation from its chief constituent. Further, anything may come out of anything—water by segregation from flesh and flesh from water. Hence, since every finite body is exhausted by the repeated abstraction of a finite body, it is evident that everything cannot subsist in everything else. For let flesh

be extracted from water and again more flesh be produced from the remainder by repeating the process of separation; then, even though the quantity separated out will continually decrease, still it will not fall below a certain magnitude. If, therefore, the process comes to an end, everything will not be in everything else (for there will be no flesh in the remaining water); if on the other hand it does not, and further extraction is always possible, there will be an infinite multitude of finite equal parts in a finite quantity—which is impossible. Another proof may be added: since every body must diminish in size when something is taken from it, and flesh is quantitatively definite in respect both of greatness and smallness, it is clear that from the minimum quantity of flesh no body can be separated out; for the flesh left would be less than the minimum of flesh.

Again, in each of his infinite bodies there would be already present infinite flesh and blood and brain—having a distinct existence, however, from one another,⁵ and no less real than the infinite bodies, and each infinite: which is contrary to reason.

188a3-188a4

The statement that complete separation never will take place is correct enough, though Anaxagoras is not fully aware of what it means. For affections are indeed inseparable. If then colours and states had entered into the mixture, and if separation took place, there would be something white or healthy which was nothing *but* white or healthy, i.e. was not the predicate of a subject. So his Mind absurdly aims at the impossible, if it is supposed to wish to separate them, and it is impossible to do so, both in respect of quantity and of quality—of quantity, because there is no minimum magnitude, and of quality, because affections are inseparable.

188a5-188a11

Nor is Anaxagoras right about the coming to be of homogeneous bodies. It is true there is a sense in which clay is divided into pieces of clay, but there is another in which it is not. Water and air are, and are generated, from each other, but not in the way in which bricks come from a house and again a house from bricks. And it is better to assume a smaller and finite number of principles, as Empedocles does.

188a12-188a18

All thinkers then agree in making the contraries principles, both those who describe the universe as one and unmoved (for even Parmenides treats hot and cold as principles under the names of fire and earth) and those too who use the rare and the dense. The same is true of Democritus also, with his plenum and void, both of which exist, he says, the one as being, the other as not being. Again he speaks of differences in position, shape, and order, and these are genera of which the species are contraries, namely, of position, above and below, before and

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⁵Retaining the MS text; Ross reads: *kechorismena mentoi ap' allelon [ou]* ('not, however, separated from one another').

behind; of shape, angular and angle-less, straight and round.

188a27-188a31

It is plain then that they all in one way or another identify the contraries with the principles. And with good reason. For first principles must not be derived from one another nor from anything else, while everything has to be derived from them. But these conditions are fulfilled by the primary contraries, which are not derived from anything else because they are primary, nor from each other because they are contraries.

188a32-188b3

But we must see how this can be arrived at as a reasoned result. Our first presupposition must be that in nature nothing acts on, or is acted on by, any other thing at random, nor may anything come from anything else, unless we mean that it does so accidentally. For how could white come from musical, unless musical happened to be an attribute of the not-white or of the black? No, white comes from not-white—and not from *any* not-white, but from black or some intermediate. Similarly, musical comes to be from non-musical, but not from any thing other than musical, but from unmusical or any intermediate state there may be.

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Nor again do things pass away into the first chance thing; white does not pass into musical (except, it may be, accidentally), but into not-white—and not into any chance thing which is not white, but into black or an intermediate; musical passes into not-musical—and not into any chance thing other than musical, but into unmusical or any intermediate state there may be.

188b9-188b20

The same holds of other things also: even things which are not simple but complex follow the same principle, but the opposite state has not received a name, so we fail to notice the fact. For what is in tune must come from what is not in tune, and *vice versa*; the tuned passes into untunedness—and not into *any* untunedness, but into the corresponding opposite. It does not matter whether we take attunement, order, or composition for our illustration; the principle is obviously the same in all, and in fact applies equally to the production of a house, a statue, or anything else. A house comes from certain things in a certain state of separation instead of conjunction, a statue (or any other thing that has been shaped) from shapelessness—each of these objects being partly order and partly composition.

188b21-188b26

If then this is true, everything that comes to be or passes away comes from, or passes into, its contrary or an intermediate state. But the intermediates are derived from the contraries—colours, for instance, from black and white. Everything, therefore, that comes to be by a natural process is either a contrary or a product of contraries.

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Up to this point we have practically had most of the other writers on the subject with us, as I have said already; for all of them identify their elements, and what they call their principles, with the contraries, giving no reason indeed for the the-

ory, but constrained as it were by the truth itself. They differ, however, from one another in that some assume contraries which are prior, others contraries which are posterior; some those more knowable in the order of explanation, others those more familiar to sense. For some make hot and cold, or again moist and dry, the causes of becoming; while others make odd and even, or again Love and Strife; and these differ from each other in the way mentioned.

Hence their principles are in one sense the same, in another different; different certainly, as indeed most people think, but the same inasmuch as they are analogous; for all are taken from the same table of columns, some of the pairs being wider, others narrower in extent. In this way then their theories are both the same and different, some better, some worse; some, as I have said, take as their contraries what is more knowable in the order of explanation, others what is more familiar to sense. (The universal is knowable in the order of explanation, the particular in the order of sense; for explanation has to do with the universal, sense with the particular.) The great and the small, for example, belong to the former class, the dense and the rare to the latter.

188b36-189a9

It is clear then that our principles must be contraries.

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§ 6 · The next question is whether the principles are two or three or more in number.

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One they cannot be; for there cannot be one contrary. Nor can they be innumerable, because, if so, what is will not be knowable; and in any one genus there is only one contrariety, and substance is one genus; also a finite number is sufficient, and a finite number, such as the principles of Empedocles, is better than an infinite multitude; for Empedocles professes to obtain all that Anaxagoras obtains from his innumerable principles. Again, some contraries are prior to others, and some arise from others—for example sweet and bitter, white and black—whereas the principles must always remain principles.

189a12-189a19

This will suffice to show that the principles are neither one nor innumerable.

189a20-189a20

Granted, then, that they are a limited number, it is plausible to suppose them more than two. For it is difficult to see how either density should be of such a nature as to act in any way on rarity or rarity on density. The same is true of any other pair of contraries; for Love does not gather Strife together and make things out of it, nor does Strife make anything out of Love, but both act on a third thing different from both. Some indeed assume more than one such thing from which they construct the world of nature.

189a21-189a27

Other objections to the view that it is not necessary to posit some other nature under the contraries may be added. We do not find that the contraries constitute

189a28-189a35

the substance of any thing. But what is a first principle ought not to be predicated of any subject. If it were, there would be a principle of the supposed principle; for the subject is a principle, and prior presumably to what is predicated of it. Again, we hold that a substance is not contrary to another substance. How then can substance be derived from what are not substances? Or how can non-substance be prior to substance?

189a36-189b16

If then we accept both the former argument and this one, we must, to preserve both, posit some third thing, such as is spoken of by those who describe the universe as one nature—water or fire or what is intermediate between them. What is intermediate seems preferable; for fire, earth, air, and water are already involved with pairs of contraries. There is, therefore, much to be said for those who make the underlying substance different from these four; of the rest, the next best choice is air, as presenting sensible differences in a less degree than the others; and after air, water. All, however, agree in this, that they differentiate their One by means of the contraries, such as density and rarity and more and less, which may of course be generalized, as has already been said, into excess and defect. Indeed this doctrine too (that the One and excess and defect are the principles of things) would appear to be of old standing, though in different forms; for the early thinkers made the two the active and the one the passive principle, whereas some of the more recent maintain the reverse.

189b17-189b18

To suppose then that the elements are three in number would seem, from these and similar considerations, a plausible view, as I said before. On the other hand, the view that they are more than three in number would seem to be untenable.

189b19-189b27

For one thing is sufficient to be acted on; but if we have four contraries, there will be two contrarieties, and we shall have to suppose an intermediate nature for each pair separately. If, on the other hand, the contrarieties, being two, can generate from each other, the second contrariety will be superfluous. Moreover, it is impossible that there should be more than one *primary* contrariety. For substance is a single genus of being, so that the principles can differ only as prior and posterior, *not* in genus; for in a single genus there is always a single contrariety, all the other contrarieties in it being held to be reducible to one.

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It is clear then that the number of elements is neither one nor more than two or three; but whether two or three is, as I said, a question of considerable difficulty.

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§ 7 · We will now give our own account, approaching the question first with reference to becoming in its widest sense; for we shall be following the natural order of inquiry if we speak first of common characteristics, and then investigate the characteristics of special cases.

We say that ‘one thing comes to be from another thing, and something from something different, in the case both of simple and of complex things. I mean the following. We can say the man becomes musical, or what is not-musical becomes musical, or the not-musical man becomes a musical man. Now what becomes in the first two cases—man and not-musical—I call *simple*, and what each becomes—musical—simple also. But when we say the not-musical man becomes a musical man, both what becomes and what it becomes are *complex*.

189b34-190a4

In some cases, we say not only this becomes so-and-so, but also from being this, it comes to be so-and-so (e.g.: from being not-musical he comes to be musical); but we do not say this in all cases, as we do not say from being a man he came to be musical but only the man became musical.

190a5-190a8

When a simple thing is said to become something, in one case it survives through the process, in the other it does not. For the man remains a man and is such even when he becomes musical, whereas what is not musical or is unmusical does not survive, either simply or combined with the subject.

190a9-190a12

These distinctions drawn, one can gather from surveying the various cases of becoming in the way we are describing that there must always be an underlying something, namely that which becomes, and that this, though always one numerically, in form at least is not one. (By ‘in form’ I mean the same as ‘in account’.) For to be a man is not the same as to be unmusical. One part survives, the other does not: what is not an opposite survives (for the man survives), but not-musical or unmusical does not survive, nor does the compound of the two, namely the unmusical man.

190a13-190a21

We speak of ‘becoming that from this’ instead of ‘this becoming that’ more in the case of what does not survive the change—‘becoming musical from unmusical’, not ‘from man’—but we sometimes use the latter form of expression even of what survives; we speak of a statue coming to be from bronze, not of the bronze becoming a statue. The change, however, from an opposite which does not survive is described in both ways, ‘becoming that from this’ or ‘this becoming that’. We say both that the unmusical becomes musical, and that from unmusical he becomes musical. And so both forms are used of the complex, ‘becoming a musical from an unmusical man’, and ‘an unmusical man becoming musical’.

190a22-190a31

Things are said to come to be in different ways. In some cases we do not use the expression ‘come to be’, but ‘come to be so-and-so’. Only substances are said to come to be without qualification.

190a32-190a33

Now in all cases other than substance it is plain that there must be something underlying, namely, that which becomes. For when a thing comes to be of such a

190a34-190a37

quantity or quality or in such a relation, time,⁶ or place, a subject is always presupposed, since substance alone is not predicated of another subject, but everything else of substance.

190b1-190b4 But that substances too, and anything that can be said to be without qualification, come to be from some underlying thing, will appear on examination. For we find in every case something that underlies from which proceeds that which comes to be; for instance, animals and plants from seed.

190b5-190b9 Things which come to be without qualification, come to be in different ways: by change of shape, as a statue; by addition, as things which grow; by taking away, as the Hermes from the stone; by putting together, as a house; by alteration, as things which turn in respect of their matter.

190b10-190b10 It is plain that these are all cases of coming to be from some underlying thing.

190b11-190b16 Thus, from what has been said, whatever comes to be is always complex. There is, on the one hand, something which comes to be, and again something which becomes that—the latter in two senses, either the subject or the opposite. By the opposite I mean the unmusical, by the subject, man; and similarly I call the absence of shape or form or order the opposite, and the bronze or stone or gold the subject.

190b17-190b23 Plainly then, if there are causes and principles which constitute natural objects and from which they primarily are or have come to be—have come to be, I mean, what each is said to be in its substance, not what each is accidentally—plainly, I say, everything comes to be from both subject and form. For the musical man is composed in a way of man and musical: you can analyse it into the definitions of its elements. It is clear then that what comes to be will come to be from these elements.

190b24-190b28 Now the subject is one numerically, though it is two in form. (For there is the man, the gold—in general, the countable matter; for it is more of the nature of a ‘this’, and what comes to be does not come from it accidentally; the privation, on the other hand, and the contrariety *are* accidental.) And the form is one—the order, the art of music, or any similar predicate.

190b29-191a2 There is a sense, therefore, in which we must declare the principles to be two, and a sense in which they are three; a sense in which the contraries are the principles—say for example the musical and the unmusical, the hot and the cold, the tuned and the untuned—and a sense in which they are not, since it is impossible for the contraries to be acted on by each other. But this difficulty also is solved by the fact that what underlies is different from the contraries; for it is

⁶Ross excises ‘time’.

itself not a contrary. The principles therefore are, in a way, not more in number than the contraries, but as it were two; nor yet precisely two, since there is a difference of being, but three. For to be man is different from to be unmusical, and to be unformed from to be bronze.

We have now stated the number of the principles of natural objects which are subject to generation, and how the number is reached; and it is clear that there must be something underlying the contraries, and that the contraries must be two. (Yet in another way of putting it this is not necessary, as one of the contraries will serve to effect the change by its absence and presence.)

191a3-191a8

The underlying nature can be known by analogy. For as the bronze is to the statue, the wood to the bed, or the matter and⁷ the formless before receiving form to any thing which has form, so is the underlying nature to substance, i.e. the 'this' or existent.

191a9-191a12

This then is one principle (though not one or existent in the same sense as the 'this'); one is the form or definition;⁸ then further there is its contrary, the privation. In what sense these are two, and in what sense more, has been stated above. We explained first that only the contraries were principles, and later that something else underlay them, and that the principles were three; our last statement has elucidated the difference between the contraries, the mutual relation of the principles, and the nature of what underlies. Whether the form or what underlies is the substance is not yet clear. But that the principles are three, and in what sense, and the way in which each is a principle, is clear.

191a13-191a21

So much then for the question of the number and the nature of the principles.

191a22-191a22

§ 8 · We will now proceed to show that the difficulty of the early thinkers, as well as our own, is solved in this way alone.

191a23-191a24

The first of those who studied philosophy were misled in their search for truth and the nature of things by their inexperience, which as it were thrust them into another path. So they say that none of the things that are either comes to be or passes out of existence, because what comes to be must do so either from what is or from what is not, both of which are impossible. For what is cannot come to be (because it *is* already), and from what is not nothing could have come to be (because something must be underlying). So too they exaggerated the consequence of this, and went so far as to deny even the *existence* of a plurality of things maintaining that only what is itself is. Such then was their opinion, and such the reason for its adoption.

191a25-191a34

⁷Ross omits 'the matter and'.

⁸Reading *mia to eidos e ho logos* (Bonitz).

191a35-191b9

Our explanation on the other hand is that for something to come to be from what is or from what is not, or what is not or what is to do something or have something done to it or become some particular thing, are in one way no different from a doctor doing something or having something done to him, or being or becoming something from being a doctor. These expressions may be taken in two ways, and so too, clearly, may ‘from what is’, and ‘what is acts or is acted on’. A doctor builds a house, not *qua* doctor, but *qua* housebuilder, and turns gray, not *qua* doctor, but *qua* dark-haired. On the other hand he doctors or fails to doctor *qua* doctor. But we are using words most appropriately when we say that a doctor does something or undergoes something, or becomes something from being a doctor, if he does, undergoes, or becomes *qua* doctor. Clearly then also to come to be so-and-so from what is not means ‘*qua* what is not’.

191b10-191b12

It was through failure to make this distinction that those thinkers gave the matter up, and through this error that they went so much farther astray as to suppose that nothing else comes to be or exists apart from what is itself, thus doing away with all becoming.

191b13-191b17

We ourselves are in agreement with them in holding that nothing can be said without qualification to come from what is not. But nevertheless we maintain that a thing may come to be from what is not in a qualified sense, i.e. accidentally. For a thing comes to be from the privation, which in its own nature is something which is not—this not surviving as a constituent of the result. Yet this causes surprise, and it is thought impossible that something should come to be in the way described from what is not.

191b18-191b26

In the same way we maintain that nothing comes to be from what is, and that what is does not come to be except accidentally. In that way, however, it does, just as animal might come to be from animal, and an animal of a certain kind from an animal of a certain kind. Thus, suppose a dog to come to be from a dog, or a horse from a horse. The dog would then, it is true, come to be from animal (as well as from an animal of a certain kind) but not as *animal*, for that is already there. But if anything is to become an animal, *not* accidentally, it will not be from animal; and if what is, not from what is—nor from what is not either, for it has been explained that by ‘from what is not’ we mean *qua* what is not.

191b27-191b27

Note further that we do not subvert the principle that everything either is or is not.

191b28-191b29

This then is one way of solving the difficulty. Another consists in pointing out that the same things can be spoken of in terms of potentiality and actuality. But

this has been done with greater precision elsewhere.⁹

So, as we said, the difficulties which constrain people to deny the existence of some of the things we mentioned are now solved. For it was this reason which also caused some of the earlier thinkers to turn so far aside from the road which leads to coming to be and passing away and change generally. If they had come in sight of this nature, all their ignorance would have been dispelled.

191b30-191b34

§ 9 · Others, indeed, have apprehended the nature in question, but not adequately.

191b35-191b35

In the first place they allow that a thing may come to be without qualification from what is not, accepting on this point the statement of Parmenides. Secondly, they think that if it is one numerically, it must have also only a single potentiality—which is a very different thing.

191b36-192a3

Now we distinguish matter and privation, and hold that one of these, namely the matter, accidentally is not, while the privation in its own nature is not; and that the matter is nearly, in a sense is, substance, while the privation in no sense is. They, on the other hand, identify their Great and Small alike with what is not, and that whether they are taken together as one or separately. Their triad is therefore of quite a different kind from ours. For they got so far as to see that there must be some underlying nature, but they make it one—for even if one philosopher¹⁰ makes a dyad of it, which he calls Great and Small, the effect is the same; for he overlooked the other nature. For the one which persists is a joint cause, with the form, of what comes to be—a mother, as it were. But the other part of the contrariety may often seem, if you concentrate your attention on it as an evil agent, not to exist at all.

192a4-192a15

For admitting that there is something divine, good, and desirable, we hold that there are two other principles, the one contrary to it, the other such as of its own nature to desire and yearn for it. But the consequence of their view is that the contrary desires its own extinction. Yet the form cannot desire itself, for it is not defective; nor can the contrary desire it, for contraries are mutually destructive. The truth is that what desires the form is matter, as the female desires the male and the ugly the beautiful—only the ugly or the female not in itself but accidentally.

192a16-192a24

The matter comes to be and ceases to be in one sense, while in another it does not. As that which contains the privation, it ceases to be in its own nature; for what ceases to be—the privation—is contained within it. But as potentiality it does not cease to be in its own nature, but is necessarily outside the sphere of becoming

192a25-192a34

⁹See *Metaphysics D7*, and *Th.*

¹⁰I.e. Plato.

and ceasing to be. For if it came to be, something must have existed as a primary substratum from which it should come and which should persist in it; but this is its own very nature, so that it will be before coming to be. (For my definition of matter is just this—the primary substratum of each thing, from which it comes to be, and which persists in the result, not accidentally.) And if it ceases to be it will pass into that at the last, so it will have ceased to be before ceasing to be.

192a35-192b2

The accurate determination of the first principle in respect of form, whether it is one or many and what it is or what they are, is the province of first philosophy; so these questions may stand over till then. But of the natural, i.e. perishable, forms we shall speak in the expositions which follow.

192b3-192b8

The above, then, may be taken as sufficient to establish that there are principles and what they are and how many there are. Now let us make a fresh start and proceed.

Book II

§ 1 · Of things that exist, some exist by nature, some from other causes. By nature the animals and their parts exist, and the plants and the simple bodies (earth, fire, air, water)—for we say that these and the like exist by nature.

192b9-192b11

All the things mentioned plainly differ from things which are *not* constituted by nature. For each of them has within itself a principle of motion and of stationariness (in respect of place, or of growth and decrease, or by way of alteration). On the other hand, a bed and a coat and anything else of that sort, *qua* receiving these designations—i.e. in so far as they are products of art—have no innate impulse to change. But in so far as they happen to be composed of stone or of earth or of a mixture of the two, they *do* have such an impulse, and just to that extent—which seems to indicate that nature is a principle or cause of being moved and of being at rest in that to which it belongs primarily, in virtue of itself and not accidentally.

192b12-192b23

I say ‘not accidentally’, because (for instance) a man who is a doctor might himself be a cause of health to himself. Nevertheless it is not in so far as he is a patient that he possesses the art of medicine: it merely has happened that the same man is doctor and patient—and that is why these attributes are not always found together. So it is with all other artificial products. None of them has in itself the principle of its own production. But while in some cases (for instance houses and the other products of manual labour) that principle is in something else external to the thing, in others—those which may cause a change in themselves accidentally—it lies in the things themselves (but not in virtue of what they are).

192b24-192b32

Nature then is what has been stated. Things have a nature which have a principle of this kind. Each of them is a substance; for it is a subject, and nature is always in a subject.

192b33-192b34

The term ‘according to nature’ is applied to all these things and also to the attributes which belong to them in virtue of what they are, for instance the property of fire to be carried upwards—which is not a nature nor has a nature but is by nature or according to nature.

192b35-193a2

What nature is, then, and the meaning of the terms ‘by nature’ and ‘according to nature’, has been stated. *That* nature exists, it would be absurd to try to prove; for it is obvious that there are many things of this kind, and to prove what is obvious by what is not is the mark of a man who is unable to distinguish what is

193a3-193a9

self-evident from what is not. (This state of mind is clearly possible. A man blind from birth might reason about colours.) Presumably therefore such persons must be talking about words without any thought to correspond.

193a10-193a12 Some identify the nature or substance of a natural object with that immediate constituent of it which taken by itself is without arrangement, e.g. the wood is the nature of the bed, and the bronze the nature of the statue.

193a13-193a16 As an indication of this Antiphon points out that if you planted a bed and the rotting wood acquired the power of sending up a shoot, it would not be a bed that would come up, but *wood* which shows that the arrangement in accordance with the rules of the art is merely an accidental attribute, whereas the substance is the other, which, further, persists continuously through the process.

193a17-193a27 But if the material of each of these objects has itself the same relation to something else, say bronze (or gold) to water, bones (or wood) to earth and so on, *that* (they say) would be their nature and substance. Consequently some assert earth, others fire or air or water or some or all of these, to be the nature of the things that are. For whatever any one of them supposed to have this character—whether one thing or more than one thing—this or these he declared to be the whole of substance, all else being its affections, states, or dispositions. Every such thing they held to be eternal (for it could not pass into anything else), but other things to come into being and cease to be times without number.

193a28-193a29 This then is one account of nature, namely that it is the primary underlying matter of things which have in themselves a principle of motion or change.

193a30-193a31 Another account is that nature is the shape or form which is specified in the definition of the thing.

193a32-193b6 For the word ‘nature’ is applied to what is according to nature and the natural in the same way as ‘art’ is applied to what is artistic or a work of art. We should not say in the latter case that there is anything artistic about a thing, if it is a bed only potentially, not yet having the form of a bed; nor should we call it a work of art. The same is true of natural compounds. What is potentially flesh or bone has not yet its own nature, and does not exist by nature, until it receives the form specified in the definition, which we name in defining what flesh or bone is. Thus on the second account of nature, it would be the shape or form (not separable except in statement) of things which have in themselves a principle of motion. (The combination of the two, e.g. man, is not nature but by nature.)

193b7-193b12 The form indeed is nature rather than the matter; for a thing is more properly said to be what it is when it exists in actuality than when it exists potentially. Again man is born from man but not bed from bed. That is why people say that the shape is not the nature of a bed, but the wood is—if the bed sprouted, not a

bed but wood would come up. But even if the shape *is* art,¹¹ then on the same principle the shape of man is his nature. For man is born from man.

Again, nature in the sense of a coming-to-be proceeds towards nature. For it is not like doctoring, which leads not to the art of doctoring but to health. Doctoring must start from the art, not lead to it. But it is not in this way that nature is related to nature. What grows *qua* growing grows from something into something. Into what then does it grow? Not into that from which it arose but into that to which it tends. The shape then is nature.

193b13-193b18

Shape and nature are used in two ways. For the privation too is in a way form. But whether in unqualified coming to be there is privation, i.e. a contrary, we must consider later.

193b19-193b21

§ 2 · We have distinguished, then, the different ways in which the term ‘nature’ is used.

193b22-193b22

The next point to consider is how the mathematician differs from the student of nature; for natural bodies contain surfaces and volumes, lines and points, and these are the subject-matter of mathematics.

193b23-193b25

Further, is astronomy different from natural science or a department of it? It seems absurd that the student of nature should be supposed to know the nature of sun or moon, but not to know any of their essential attributes, particularly as the writers on nature obviously do discuss their shape and whether the earth and the world are spherical or not.

193b26-193b31

Now the mathematician, though he too treats of these things, nevertheless does not treat of them as the limits of a natural body; nor does he consider the attributes indicated as the attributes of such bodies. That is why he separates them; for in thought they are separable from motion, and it makes no difference, nor does any falsity result, if they are separated. The holders of the theory of Forms do the same, though they are not aware of it; for they separate the objects of natural science, which are less separable than those of mathematics. This becomes plain if one tries to state in each of the two cases the definitions of the things and of their attributes. Odd and even, straight and curved, and likewise number, line, and figure, do not involve motion; not so flesh and bone and man—*these* are defined like snub nose, not like curved.

193b32-194a6

Similar evidence is supplied by the more natural of the branches of mathematics, such as optics, harmonics, and astronomy. These are in a way the converse of geometry. While geometry investigates natural lines but not *qua* natural, optics investigates mathematical lines, but *qua* natural, not *qua* mathematical.

194a7-194a11

¹¹Reading *techne*, with the MSS, for Ross’ *physis*.

194a12-194a18 Since two sorts of thing are called nature, the form and the matter, we must investigate its objects as we would the essence of snubness, that is neither independently of matter nor in terms of matter only. Here too indeed one might raise a difficulty. Since there are two natures, with which is the student of nature concerned? Or should he investigate the combination of the two? But if the combination of the two, then also each severally. Does it belong then to the same or to different sciences to know each severally?

194a19-194a21 If we look at the ancients, natural science would seem to be concerned with the *matter*. (It was only very slightly that Empedocles and Democritus touched on form and essence.)

194a22-194a27 But if on the other hand art imitates nature, and it is the part of the same discipline to know the form and the matter up to a point (e.g. the doctor has a knowledge of health and also of bile and phlegm, in which health is realized and the builder both of the form of the house and of the matter, namely that it is bricks and beams, and so forth): if this is so, it would be the part of natural science also to know nature in both its senses.

194a28-194a33 Again, that for the sake of which, or the end, belongs to the same department of knowledge as the means. But the nature is the end or that for the sake of which. For if a thing undergoes a continuous change toward some end, that last stage¹² is actually that for the sake of which. (That is why the poet was carried away into making an absurd statement when he said ‘he has the end for the sake of which he was born’. For not every stage that is last claims to be an end, but only that which is best.)

194a34-194b8 For the arts make their material (some simply make it, others make it serviceable), and we use everything as if it was there for our sake. (We also are in a sense an end. ‘That for the sake of which’ may be taken in two ways, as we said in our work *On Philosophy*.) The arts, therefore, which govern the matter and have knowledge are two, namely the art which uses the product and the art which directs the production of it. That is why the using art also is in a sense directive; but it differs in that it knows the form,¹³ whereas the art which is directive as being concerned with production knows the matter. For the helmsman knows and prescribes what sort of form a helm should have, the other from what wood it should be made and by means of what operations. In the products of art, however, we make the material with a view to the function, whereas in the products of nature the matter is there all along.

¹²Reading *touto eschaton*.

¹³Omitting *he architektonike*.

Again, matter is a relative thing—for different forms there is different matter.

194b9-194b9

How far then must the student of nature know the form or essence? Up to a point, perhaps, as the doctor must know sinew or the smith bronze (i.e. until he understands the purpose of each);¹⁴ and the student of nature is concerned only with things whose forms are separable indeed, but do not exist apart from matter. Man is begotten by man and by the sun as well. The mode of existence and essence of the separable it is the business of first philosophy to define.

194b10-194b15

§ 3 · Now that we have established these distinctions, we must proceed to consider causes, their character and number. Knowledge is the object of our inquiry, and men do not think they know a thing till they have grasped the ‘why’ of it (which is to grasp its primary cause). So clearly we too must do this as regards both coming to be and passing away and every kind of natural change, in order that, knowing their principles, we may try to refer to these principles each of our problems.

194b16-194b23

In one way, then, that out of which a thing comes to be and which persists, is called a cause, e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species.

194b24-194b26

In another way, the form or the archetype, i.e. the definition of the essence, and its genera, are called causes (e.g. of the octave the relation of 2:1, and generally number), and the parts in the definition.

194b27-194b29

Again, the primary source of the change or rest; e.g. the man who deliberated is a cause, the father is cause of the child, and generally what makes of what is made and what changes of what is changed.

194b30-194b32

Again, in the sense of end or that for the sake of which a thing is done, e.g. health is the cause of walking about. (‘Why is he walking about?’ We say: ‘To be healthy’, and, having said that, we think we have assigned the cause.) The same is true also of all the intermediate steps which are brought about through the action of something else as means towards the end, e.g. reduction of flesh, purging, drugs, or surgical instruments are means towards health. All these things are for the sake of the end, though they differ from one another in that some are activities, others instruments.

194b33-195a2

This then perhaps exhausts the number of ways in which the term ‘cause’ is used.

195a3-195a3

As things are called causes in many ways, it follows that there are several causes of the same thing (not merely accidentally), e.g. both the art of the sculptor

195a4-195a14

¹⁴Reading *mechri tou · tinos gar* (Jaeger).