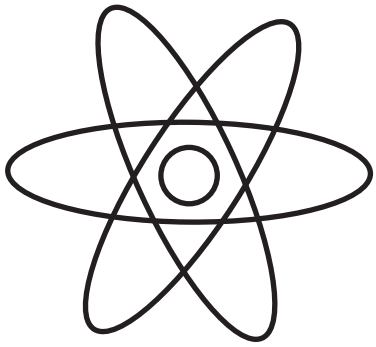

PHYSICS BY ARISTOTLE

Book 1

1

WHEN the objects of an inquiry, in any department, have principles, conditions, or elements, it is through acquaintance with these that knowledge, that is to say scientific knowledge, is attained. For we do not think that we know a thing until we are acquainted with its primary conditions or first principles, and have carried our analysis as far as its simplest elements. Plainly therefore in the science of Nature, as in other branches of study, our first task will be to try to determine what relates to its principles.

The natural way of doing this is to start from the things which are more knowable and obvious 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 in the present inquiry 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.

Now what is to us plain and obvious at first is rather confused masses, the elements and principles of which become known to us later by analysis. Thus we must advance from generalities to particulars; for it is a whole that is best known to sense-perception, and a generality is a kind of whole, comprehending many things within it, like parts. Much the same thing happens in the relation of the name to the formula. A name, e.g. 'round', means vaguely a sort of whole: its definition analyses this into its particular senses. 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 (a) one or (b) more than one. If (a) one, it must be either (i) motionless, as Parmenides and Melissus assert, or (ii) in motion, as

the physicists hold, some declaring air to be the first principle, others water. If (b) more than one, then either (i) a finite or (ii) an infinite plurality. If (i) finite (but more than one), then either two or three or four or some other number. If (ii) infinite, then either as Democritus believed one in kind, but differing in shape or form; or different in kind and even contrary.

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 too are inquiring whether the principle or element is one or many.

Now to investigate whether Being 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 or common to all-so a man investigating principles cannot argue with one who denies their existence. For if Being 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.

To inquire therefore whether Being 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 Being 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 palpable and offers no difficulty at all: accept one ridiculous proposition and the rest follows-a simple enough proceeding.

We physicists, 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 man of science 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 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.

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 senses. 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.

For if both substance and quantity and quality are, then, whether these exist independently of each other or not, Being will be many.

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 the impossible can properly be called absurd. For none of the others can exist independently: substance alone is independent: for everything is predicated of substance as subject. Now Melissus says that Being 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 through a concomitant attribute, 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 Being 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.

Again, 'one' itself, no less than 'being', is used in many senses, so we must consider in what sense the word is used when it is said that the All is one.

Now we say that (a) the continuous is one or that (b) the indivisible is one, or (c) things are said to be 'one', when their essence is one and the same, as 'liquor' and 'drink'.

If (a) their One is one in the sense of continuous, it is many, for the continuous is divisible ad infinitum.

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 how they can be one or many, and, if they are more than one, in what sense 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.
But to proceed: If (b) their One is one as indivisible, nothing will have quantity or quality, and so the one 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 (c) 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 size'.

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 'being' were always used in one and the same sense. What 'is' may be many either in definition (for example 'to be white' is one thing, 'to be musical' another, yet the same thing 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 'one' may mean either 'potentially one' or 'actually one'.

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 palpable and offers no difficulty at all: admit one ridiculous proposition and the rest follows-a simple enough proceeding.] 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 in the full sense but also in the case of coming to have a quality-as if change never took place suddenly. Again, does it follow that Being, 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, Being 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.

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 one is used in a single sense 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.

It is necessary for him, then, to assume not only that 'being' has the same meaning, of whatever it is predicated, but further that it means (1) what just is and (2) what is just one.

It must be so, for (1) an attribute is predicated of some subject, so that the subject to which 'being' is attributed will not be, as it is something different from 'being'. Something, therefore, which is not will be. Hence 'substance' will not be a predicate of anything else. For the subject cannot be a being, unless 'being' means several things, in such a way that each is something. But ex hypothesi 'being' means only one thing.

If, then, 'substance' is not attributed to anything, but other things are attributed to it, how does 'substance' mean what is rather than what is not? For suppose that 'substance' is also 'white'. Since the definition of the latter is different (for being cannot even be attributed to white, as nothing is which is not 'substance'), it follows that 'white' is not-being—and that not in the sense of a particular not-being, but in the sense that it is not at all. Hence 'substance' is not; for it is true to say that it is white, which we found to mean not-being. If to avoid this we say that even 'white' means substance, it follows that 'being' has more than one meaning.

In particular, then, Being will not have magnitude, if it is substance. For each of the two parts must he in a different sense.

(2) Substance is plainly divisible into other substances, if we consider the mere nature of a definition. For instance, if 'man' is a substance, 'animal' and 'biped' must also be

substances. For if not substances, they must be attributes-and if attributes, attributes either of (a) man or of (b) some other subject. But neither is possible.

(a) 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.

(b) 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 a substance, then 'man' too will be an attribute of something else. But we must assume that substance is not the attribute of anything, that the subject of which both 'biped' and 'animal' and each separately are predicated is the subject also of the complex 'biped animal'.

Are we then to say that the All is composed of indivisible substances? 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 not-being is; to that from bisection, they yielded by positing atomic magnitudes. But obviously it is not true that if being means one thing, and cannot at the same time mean the contradictory of this, 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 a particular not-being. To say that all things will be one, if there is nothing besides Being itself, is absurd. For who understands 'being itself' to be anything but a particular substance? But if this is so, there is nothing to prevent there being many beings, as has been said.

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

4

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

The first set make the underlying body one either one of the three 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 make 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).

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 'homceomerous' substances and his contraries infinite in multitude, whereas Empedocles posits only the so-called elements.

The theory of Anaxagoras that the principles are infinite in multitude was probably due to his acceptance of the common opinion of the physicists that nothing comes into being from not-being. 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 proceed 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 every. thing, because they saw everything arising out of everything. But things, as they say, appear different from one another and receive different names according to the nature of the particles which are numerically predominant among the innumerable constituents of the mixture. For nothing, they say, is purely and entirely white or black or sweet, bone or flesh, but the nature of a thing is held to be that of which it contains the most.

Now (1) 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.

Further (2) if the parts of a whole may be of any size in the direction either of greatness or of smallness (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 be of any size. Clearly, therefore, since 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.

Again (3) 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 seems obviously to follow 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 particles 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.

Lastly (4) 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, and no less real than the infinite bodies, and each infinite: which is contrary to reason.

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 a 'white' or a 'healthy' which was nothing but white or healthy, i.e. was not the predicate of a subject. So his 'Mind' is an absurd person aiming at the impossible, if he 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.

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.

5

All thinkers then agree in making the contraries principles, both those who describe the All 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, be 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 behind; of shape, angular and angle-less, straight and round.

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.

But we must see how this can be arrived at as a reasoned result, as well as in the way just indicated.

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 in virtue of a concomitant attribute. 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 colour. Similarly, 'musical' comes to be from 'not-musical', but not from any thing other than musical, but from 'unmusical' or any intermediate state there may be.

Nor again do things pass into the first chance thing; 'white' does not pass into 'musical' (except, it may be, in virtue of a concomitant attribute), but into 'not-white'-and not into

any chance thing which is not white, but into black or an intermediate colour; 'musical' passes into 'not-musical'-and not into any chance thing other than musical, but into 'unmusical' or any intermediate state there may be.

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. 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 any other complex. 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.

If then this is true, everything that comes to be or passes away 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.

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 theory, but contrained as it were by the truth itself. They differ, however, from one another in that some assume contraries which are more primary, others contraries which are less so: 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 conditions 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 more 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.

It is clear then that our principles must be contraries.

6

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

One they cannot be, for there cannot be one contrary. Nor can they be innumerable, because, if so, Being 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 from his principles all that Anaxagoras obtains from his innumerable principles. Lastly, some contraries are more primary than others, and some arise from others-for example sweet and bitter, white and black-whereas the principles must always remain principles.

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

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.

Other objections to the view that it is not necessary to assume a third principle as a substratum may be added. (1) We do not find that the contraries constitute the substance of any thing. But what is a first principle ought not to be the predicate 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 (2) 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-substances be prior to substance?

If then we accept both the former argument and this one, we must, to preserve both, assume a third somewhat as the substratum of the contraries, such as is spoken of by

those who describe the All 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.

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.

For the one substratum 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; in a single genus there is always a single contrariety, all the other contrarieties in it being held to be reducible to one.

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.

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 one sort of thing from another sort of thing, both in the case of simple and of complex things. I mean the following. We

can say (1) ‘man becomes musical’, (2) what is ‘not-musical becomes musical’, or (3), the ‘not-musical man becomes a musical man’. Now what becomes in (1) and (2)-’man’ and ‘not musical’-I call simple, and what each becomes-’musical’-simple also. But when (3) we say the ‘not-musical man becomes a musical man’, both what becomes and what it becomes are complex.

As regards one of these simple ‘things that become’ we say not only ‘this becomes so-and-so’, but also ‘from being this, comes to be so-and-so’, as ‘from being not-musical comes to be musical’; as regards the other we do not say this in all cases, as we do not say (1) ‘from being a man he came to be musical’ but only ‘the man became musical’.

When a ‘simple’ thing is said to become something, in one case (1) it survives through the process, in the other (2) it does not. For man remains a man and is such even when he becomes musical, whereas what is not musical or is unmusical does not continue to exist, either simply or combined with the subject.

These distinctions drawn, one can gather from surveying the various cases of becoming in the way we are describing that, as we say, 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 that I mean that it can be described in different ways.) For ‘to be man’ is not the same as ‘to be unmusical’. One part survives, the other does not: what is not an opposite survives (for ‘man’ survives), but ‘not-musical’ or ‘unmusical’ does not survive, nor does the compound of the two, namely ‘unmusical man’.

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 there are exceptions, as 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 indifferently 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 man from an unmusical man’, and unmusical man becoming a musical man’.

But there are different senses of ‘coming to be’. 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’ in the unqualified sense.

Now in all cases other than substance it is plain that there must be some subject, namely, that which becomes. For we know that when a thing comes to be of such a quantity or quality or in such a relation, time, or place, a subject is always presupposed, since substance alone is not predicated of another subject, but everything else of substance.

But that substances too, and anything else that can be said 'to be' without qualification, come to be from some substratum, 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.

Generally things which come to be, come to be in different ways: (1) by change of shape, as a statue; (2) by addition, as things which grow; (3) by taking away, as the Hermes from the stone; (4) by putting together, as a house; (5) by alteration, as things which 'turn' in respect of their material substance.

It is plain that these are all cases of coming to be from a substratum.

Thus, clearly, from what has been said, whatever comes to be is always complex. There is, on the one hand, (a) something which comes into existence, and again (b) something which becomes that-the latter (b) 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'.

Plainly then, if there are conditions 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 essential nature, not what each is in respect of a concomitant attribute-plainly, I say, everything comes to be from both subject and form. For '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.

Now the subject is one numerically, though it is two in form. (For it is the man, the gold-the 'matter' generally-that is counted, for it is more of the nature of a 'this', and what comes to be does not come from it in virtue of a concomitant attribute; the privation, on the other hand, and the contrary are incidental in the process.) And the positive form is one-the order, the acquired art of music, or any similar predicate.

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 the substratum is different from the contraries, for it is 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 essential nature, 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 a substratum for 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 successive absence and presence.)

The underlying nature is an object of scientific knowledge, by an analogy. For as the bronze is to the statue, the wood to the bed, or the matter and the formless before receiving form to any thing which has form, so is the underlying nature to substance, i.e. the 'this' or existent.

This then is one principle (though not one or existent in the same sense as the 'this'), and the definition was one as we agreed; then further there is its contrary, the privation. In what sense these are two, and in what sense more, has been stated above. Briefly, we explained first that only the contraries were principles, and later that a substratum was indispensable, 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 the substratum. Whether the form or the substratum is the essential nature of a physical object 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.

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

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.

The first of those who studied science 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 present as a substratum). 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 Being itself is. Such then was their opinion, and such the reason for its adoption.

Our explanation on the other hand is that the phrases 'something comes to be from what is or from what is not', 'what is not or what is does something or has something done to it or becomes some particular thing', are to be taken (in the first way of putting our explanation) in the same sense as 'a doctor does something or has something done to him', 'is or becomes something from being a doctor.' These expressions may be taken in two senses, and so too, clearly, may 'from being', and 'being 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 not-being' means 'qua not-being'.

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 Being itself, thus doing away with all becoming.

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'-that is, in a qualified sense. For a thing comes to be from the privation, which in its own nature is not-being,-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.

In the same way we maintain that nothing comes to be from being, and that being does not come to be except in a qualified sense. 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 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 in a qualified sense, it will not

be from animal: and if being, not from being-nor from not-being either, for it has been explained that by 'from not being' we mean from not-being qua not-being.

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

This then is one way of solving the difficulty. Another consists in pointing out that the same things can be explained in terms of potentiality and actuality. But this has been done with greater precision elsewhere. 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.

9

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

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

Now we distinguish matter and privation, and hold that one of these, namely the matter, is not-being only in virtue of an attribute which it has, while the privation in its own nature is not-being; 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 not being, 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 philosopher 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 negative part of the contrariety may often seem, if you concentrate your attention on it as an evil agent, not to exist at all.

For admitting with them 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

wtextinction. 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 per se but per accidens.

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 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 special 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 without qualification, and which persists in the result.) 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.

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 the primary type of science; so these questions may stand over till then. But of the natural, i.e. perishable, forms we shall speak in the expositions which follow.

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.