Aristotle

Physics

Translated
With Introduction and Notes
By

C. D. C. Reeve

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Preface

A worthwhile translation of the *Physics* must be accurate and consistent and be accompanied by sufficient annotation to make its contents accessible. Some of this annotation can consist, as it does here, of texts selected from other works of Aristotle, so that, while traveling through the region of the Aristotelian world the *Physics* describes, the reader can also travel through other regions of it, acquiring an ever widening and deepening grasp on the whole. But much of it must simply be explanatory, clarificatory, and interpretative. To make the journey as convenient as possible sequentially numbered endnotes take the place of footnotes and glossary entries, so that the information most needed at each juncture is available in a single location. The non-sequential reader, interested in a particular passage, will find in the detailed Index of Terms a guide to places where focused discussion of a term or notion occurs. The Glossary shows key Greek terms and their English equivalents. The Introduction describes the book that lies ahead, explaining what it is about, what it is trying to do, and how it goes about doing it. It is not a comprehensive discussion of all the important topics in the *Physics*, nor is it an expression of scholarly consensus on those it does discuss, but rather my own take on them. The same is true of many of the more interpretative notes. They are a place to start, not a place to finish—a first step in the vast dialectical task of coming to understand Aristotle for oneself. It is a reader willing to undertake this task that Aristotle requires and most rewards and that I have most had in mind.

I have benefited from the work of previous translators and commentators, especially David Ross, whose edition of the Greek text, commentary on it, and translation of it has been essential, and Pierre Pellegrin, whose excellent French edition has been a constant source of enlightenment. The various volumes devoted to the *Physics* in the Clarendon Aristotle Series have also often been helpful.

I am indebted, too, to David Riesbeck for his careful line reading and for his many useful and insightful comments, suggestions, and corrections.

I renew my thanks to ΔΚΕ, the first fraternity in the United States to endow a professorial chair, and to the University of North Carolina for awarding it to me. The generous research funds, among other things, that the endowment makes available each year have allowed me to travel to

conferences and to acquire books, computers, and other research materials and assistance, without which my work would have been much more difficult.

Finally and wholeheartedly, I again thank Deborah Wilkes, Liz Wilson, and all at Hackett, for their friendship and help.

Abbreviations

Aristotle

Citations of Aristotle's works are made to Immanuel Bekker, *Aristotelis Opera* (Berlin: 1831 [1970]), in the canonical form of abbreviated title, book number (when the work is divided into books), chapter number, page number, column letter, and line number. In the case of the *Physics*, however, the title of the work is usually omitted. An * indicates a work whose authenticity has been seriously questioned; ** indicates a work attributed to Aristotle but generally agreed not to be by him. The abbreviations used are as follows:

APo.	*Posterior Analytics*
APr.	*Prior Analytics*
Cael.	*De Caelo (On the Heavens)*
Cat.	*Categories*
DA	*De Anima (On the Soul)*
Div. Somn.	*On Divination in Sleep* (Ross)
EE	*Eudemian Ethics*
GA	*Generation of Animals*
GC	*On Coming to Be and Passing Away (De Generatione et Corruptione)* (Joachim)
HA	*History of Animals (Balme)*
IA	*Progression of Animals (De Incessu Animalium)*
Int.	*De Interpretatione*
Juv.	*On Youth and Old Age, Life and Death, and Respiration* (Ross)
LI	*On Indivisible Lines***
Long.	*On Length and Shortness of Life* (Ross)
MA	*Movement of Animals* (Nussbaum)

Mem.	*On Memory* (Ross)
Mete.	*Meteorology*
NE	*Nicomachean Ethics*
PA	*Parts of Animals*
Ph.	*Physics*
Po.	*Poetics*
Pol.	*Politics*
Pr.	*Problems**
Rh.	*Rhetoric*
SE	*Sophistical Refutations*
Sens.	*Sense and Sensibilia*
Somn.	*On Sleep*
Top.	*Topics*

I cite and translate the *Oxford Classical Texts* (OCT) editions of these works, where available, otherwise Bekker or the editions noted:

Balme, D. *Aristotle: Historia Animalium* (Cambridge, 2002).
Joachim, H. *Aristotle on Coming-to-Be and Passing-Away* (Oxford, 1926).
Mayhew, R. *Aristotle: Problems* (Cambridge, Mass., 2011).
Nussbaum, M. *Aristotle's De Motu Animalium: Text with Translation, Commentary, and Interpretative Essays* (Princeton, 1978).
Rose, V. *Aristotelis Fragmenta*, 3rd ed. (Leipzig, 1886).
Ross, D. *Aristotle Parva Naturalia* (Oxford, 1955).

Plato

Chrm.	*Charmides*
Euthphr.	*Euthyphro*
Lg.	*Laws*
Phd.	*Phaedo*
Phlb.	*Philebus*
Prm.	*Parmenides*
Phdr.	*Phaedrus*

Prt.	*Protagoras*
Rep.	*Republic*
Tht.	*Theaetetus*
Ti.	*Timaeus*

Translations of Plato in the notes are based on those in J. M. Cooper, ed., *Plato: Complete Works* (Indianapolis, 1997) and on my *Trials of Socrates* (Indianapolis, 2002) and *Plato: Republic* (Indianapolis, 2004).

Other Abbreviations and Symbols

Apostle = H. Apostle, *Aristotle's Physics: Translated with Commentaries and Glossary* (Bloomington, 1969).

Baltussen = H. Baltussen, M. Atkinson, M. Share, I. Mueller, *Simplicius: On Aristotle Physics 1.5–9* (London, 2012).

Barnes = J. Barnes, *The Complete Works of Aristotle: The Revised Oxford Translation* (Princeton, 1984).

Campbell I–V = D. Campbell, *Greek Lyric* (5 vols., Loeb, 1991–1993).

Chantraine = P. Chantraine, *Dictionnaire Étymologique de la Langue Grecque* (Paris, 1968).

Charlton = W. Charlton, *Aristotle's Physics Books I and II* (Oxford, 1970).

Coope = U. Coope, *Time for Aristotle: Physics IV.10–14* (Oxford, 2005).

Cooper = J. Cooper, "Aristotelian Infinites," *Oxford Studies in Ancient Philosophy* LI (Winter, 2016): 160–206.

DK = H. Diels and W. Kranz, eds., *Die Fragmente der Vorsokratiker,* 6th ed. (Berlin, 1951).

Dover = K. J. Dover, *Aristophanes: Frogs* (Oxford, 1993).

Graham = D. Graham, *Aristotle Physics Book VIII* (Oxford, 1999).

Hardie & Gaye = R. Hardie and R. Gaye, *Physica* in D. Ross (ed.), *The Works of Aristotle*, Vol. II (Oxford, 1930).

Heath = T. Heath, *Mathematics in Aristotle* (Oxford, 1949).

Hussey = E. Hussey, *Aristotle's Physics Books III and IV* (Oxford, 1983).

Kock = T. Kock., ed., *Comicorum Graecorum Fragmenta* (Leipzig, 1880–1888).

Maso = S. Maso, C. Natali, and G. Seel, eds., *Reading Aristotle's Physics VII.3: What Is Alteration?* (Las Vegas, 2012).

P = P. Pellegrin, *Aristote: Physique* (Paris, 2002).

PNC = Principle of non-contradiction.

R^3 = V. Rose, *Aristotelis Fragmenta*, 3rd ed. (Leipzig, 1886).

Ross = D. Ross, *Aristotle's Physics: A Revised Text with Introduction and Commentary* (Oxford, 1936).

Schiefsky = M. J. Schiefsky, *Hippocrates on Ancient Medicine: Translated with an Introduction and Commentary* (Leiden, 2005).

Simp. = Diels, H., ed., *Simplicius in Aristotelis Physica Commentaria* (Berlin, 1882–1895).

Tarán = L. Tarán, *Speusippus of Athens* (Leiden, 1981).

TEGP = D. W. Graham, *The Texts of Early Greek Philosophy: The Complete Fragments and Selected Testimonies of the Major Presocratics* (Cambridge, 2010).

Theophr. *Met*. = D. Ross and F. Fobes, *Theophrastus Metaphysics* (Oxford, 1929; repr. Hildesheim, 1967).

Wicksteed & Cornford = P. Wicksteed and F. Cornford, *Aristotle: The Physics I* (Cambridge, Mass., 1957), *The Physics II* (Cambridge, Mass., 1934).

A = B = A is identical to (equivalent to) B.

A ≈ B = A is roughly the same as or roughly equivalent or analogous to B.

A ⊃ B = If A then B, or A implies B.

Introduction

Life and Works

Aristotle was born in 384 BC to a well-off family living in the small town of Stagira in northern Greece. His father, Nicomachus, who died while Aristotle was still quite young, was allegedly doctor to King Amyntas of Macedon. His mother, Phaestis, was wealthy in her own right. When Aristotle was seventeen his guardian, Proxenus, sent him to study at Plato's Academy in Athens. He remained there for twenty years, initially as a student, eventually as a researcher and teacher.

When Plato died in 347, leaving the Academy in the hands of his nephew Speusippus, Aristotle left Athens for Assos in Asia Minor, where the ruler, Hermias, was a patron of philosophy. He married Hermias' niece Pythias, and had a daughter by her, also named Pythias. Three years later, in 345, after Hermias had been killed by the Persians, Aristotle moved to Mytilene on the island of Lesbos, where he met Theophrastus, who was to become his best student and closest colleague.

In 343 Aristotle seems to have been invited by Philip of Macedon to be tutor to the latter's thirteen-year-old son, Alexander, later called "the Great." In 335 Aristotle returned to Athens and founded his own institute, the Lyceum. While he was there his wife died and he established a relationship with Herpyllis, also a native of Stagira. Their son Nicomachus was named for Aristotle's father, and the *Nicomachean Ethics* may, in turn, have been named for him or transcribed by him. In 323 Alexander the Great died, with the result that anti-Macedonian feeling in Athens grew stronger. Perhaps threatened with a formal charge of impiety (*NE* X 7 $1177^{b}33$), Aristotle left for Chalcis in Euboea, where he died twelve months later, in 322, at the age of sixty-two.

Legend has it that Aristotle had slender calves, small eyes, spoke with a lisp, and was "conspicuous by his attire, his rings, and the cut of his hair." His will reveals that he had a sizable estate, a domestic partner, two children, a considerable library, and a large circle of friends. In it Aristotle asks his executors to take special care of Herpyllis. He directs that his slaves be freed "when they come of age" and that the bones of his wife, Pythias, be mixed with his "as she instructed."

Although the surviving writings of Aristotle occupy almost 2,500 tightly printed pages in English, most of them are not works polished for publication but sometimes incomplete lecture notes and working papers. This accounts for some, though not all, of their legendary difficulty. It is unfair to complain, as a Platonist opponent did, that Aristotle "escapes refutation by clothing a perplexing subject in obscure language, using darkness like a squid to make himself hard to catch," but there is darkness and obscurity enough for anyone, even if none of it is intentional. There is also a staggering breadth and depth of intellect. Aristotle made fundamental contributions to a vast range of disciplines, including logic, metaphysics, epistemology, psychology, ethics, politics, rhetoric, aesthetics, zoology, biology, physics, and philosophical and political history. When Dante called him "the master of those who know," he was scarcely exaggerating.

What the Physics *Is*

One thing we might mean by the *Physics* is what we now find in the pages that make up W. D. Ross's Oxford Classical Text (OCT) edition of the Greek text, first published in 1950, which is the basis of the present translation. This is the descendant of texts derived—via manuscripts copied in the Byzantine period (from the tenth to the fifteenth centuries AD)—from manuscripts that derive in turn from the edition of Aristotle's works produced by Andronicus of Rhodes in the first century BC. Thus Ross's edition, like most other modern editions, records in the textual apparatus at the bottom of the page various manuscript readings alternative to the one he prints in the body of his text. In some cases, I have preferred one of these readings, or some other reading suggested by an editor, indicating my preference in the associated notes. Also present in Ross's text, as in all worthwhile modern editions, are book and chapter divisions provided by editors as well as the page numbers of Immanuel Bekker, *Aristotelis Opera*. Here these appear in the margins of the print edition, and between upright lines in the translation itself in the electronic one (for example, |211^{a}10|), at the end of the first line in a column to which they apply. Occasional material in square brackets is my clarificatory addition.*

The second thing we might mean by the *Physics* is the work itself, so to speak, the more abstract entity that is embodied in a good edition of the Greek text and (ideally) in any translation of it. And it is clear from the beginning that its focus at any rate is on the world of nature (*phusis*), a

*Some issues concerning the unity of the text are discussed in the headnote to Book VII.

world pretty much coincident with the sublunary realm, consisting canonically of matter-form compounds, whose material component involves the sublunary elements—earth, water, air, and fire. Were these the only substances, the only primary beings, we learn in the *Metaphysics*, the science of them would be the science that the *Metaphysics* itself wishes to investigate, and which is referred to as theoretical wisdom, the science of being qua being, and the primary science or primary philosophy.

> That natural science is a theoretical science, then, is evident from these considerations. Mathematics too is a theoretical one, but whether its objects are immovable and separable is not now clear; however, it is clear that *some* parts of mathematics get a theoretical grasp on their objects insofar as they are immovable and insofar as they are separable. But if there is something that is eternal and immovable and separable, it is evident that knowledge of it belongs to a theoretical science—not, however, to *natural* science (for natural science is concerned with certain moveable things) nor to mathematics, but to something prior to both. For natural science is concerned with things that are inseparable but not immovable, while certain parts of mathematics are concerned with things that are immovable and not separable but as in matter. The primary science, by contrast, is concerned with things that are both separable and immovable. Now all causes are necessarily eternal, and these most of all. For they are the causes of the divine beings that are perceptible. There must, then, be three theoretical philosophies, mathematical, natural, and theological, since it is quite clear that if the divine belongs anywhere, it belongs in a nature of this sort. And of these, the most estimable must be concerned with the most estimable genus. Thus, the theoretical are the more choiceworthy of the various sciences, and this of the theoretical. . . . If, then, there is no other substance beyond those composed by nature, natural science will be the primary science. But if there is some immovable substance, this [that is, theological philosophy] will be prior and will be primary philosophy. (*Met*. VI 1 $1026^{a}6$–30)

That there is a substance that is at any rate eternal and immovable is argued in *Physics* VIII, and that the gods, including in particular *the* god, are among them is presupposed from quite early on in the *Metaphysics*. Thus in *Met*. I 2 we hear that theoretical wisdom is the science of this god, both in having him as its subject matter and in being the science that is

in some sense his science. When it is argued in XII 9 that he must be "the active understanding [that] is active understanding of active understanding" ($1074^{b}34$–35), we see how much *his* it is, since actively understanding itself—contemplating itself in an exercise of theoretical wisdom—is just what Aristotle's god *is*.

With just this much on the table there is already a puzzle whose difficulty is increased by special doctrine. Aristotle usually divides the bodies of knowledge he refers to as *epistêmai* ("sciences") into three types: theoretical, practical, and productive (crafts). When he is being especially careful, he also distinguishes within the theoretical sciences between the *strictly theoretical* ones (astronomy, theology), as we may call them, and the *natural* ones, which are like the strictly theoretical ones in being neither practical nor productive but unlike them in consisting of propositions that—though necessary and universal in some sense—hold for the most part rather than without exception:

> If all thought is either practical or productive or theoretical, natural science would have to be some sort of theoretical science—but a theoretical science that is concerned with such being as is capable of being moved and with the substance that in accord with its account holds for the most part only, because it is not separable. (*Met*. VI 1 $1025^{b}25$–28; compare *Ph*. II 9 $200^{a}30$–$^{b}9$)

Psychology, as a result, has an interestingly mixed status, part strictly theoretical (because it deals with understanding, which is something divine), part natural (because it deals with perception and memory and other capacities that require a body):

> It is clear that the affections of the soul are enmattered accounts. So their definitions will be of this sort, for example: "Being angry is a sort of movement of such-and-such a sort of body, or of a part or a capacity, as a result of something for the sake of something." And this is why it already belongs to the natural scientist to get a theoretical grasp on the soul, either all soul or this sort of soul. But a natural scientist and a dialectician would define each of these differently—for example, what anger is. For a dialectician it is a desire for retaliation or something like that, whereas for a natural scientist it is a boiling of the blood and hot stuff around the heart. Of these, the scientist gives the matter, whereas the dialectician gives the form and the account. For this is the account of the thing, although it must be in matter of such-and-such a sort if it is to exist. And so of a

> house the account is this, that it is a shelter to prevent destruction by winds, rain, and heat. But one person will say that it is stones, bricks, and timbers, and another that it is the form in them for the sake of these other things. Which of these people, then, is the natural scientist? Is it the one concerned with the matter but ignorant of the account, or the one concerned with the account alone? Or is it rather the one concerned with what is composed of both? Who, then, is each of the others? Or isn't it that there is no one who is concerned with the attributes of the matter that are not separable and insofar as they are not separable? And isn't it, rather, the natural scientist who is concerned with everything that is a function or attribute of this sort of body and this sort of matter? And isn't anything not of this sort the concern of someone else, in some cases a craftsman, if there happens to be one, such as a builder or a doctor? And aren't those things that are not actually separable, but are considered insofar as they are not attributes of this sort of body and in abstraction from it, the concern of the mathematician? And insofar as they are actually separable, that of the primary philosopher? (*DA* I 1 $403^{a}25$–$^{b}16$)

When science receives its focused discussion in the *Nicomachean Ethics*, however, Aristotle is explicit that if we are "to speak in an exact way and not be guided by mere similarities" (VI 3 $1139^{b}19$), we should not call anything a science unless it deals with eternal, entirely exceptionless facts about universals that are wholly necessary and do not at all admit of being otherwise ($1139^{b}20$–21). Since he is here explicitly epitomizing his more detailed discussion of science in the *Posterior Analytics* (as $1139^{b}27$ tells us), we should take the latter too as primarily a discussion of science in the exact sense, which it calls *epistêmê haplôs*—unconditional scientific knowledge. It follows that only the strictly theoretical sciences are sciences in this sense. It is on these that the others should be modeled to the extent that they can be: "it is the things that are always in the same state and never undergo change that we must make our basis when pursuing the truth, and this is the sort of thing that the heavenly bodies are" (*Met*. XI 6 $1063^{a}13$–15).

Having made the acknowledgment, though, we must also register the fact that Aristotle himself mostly does not speak in the exact way but instead persistently refers to bodies of knowledge other than the strictly theoretical sciences as *epistêmai*. His division of the *epistêmai* into theoretical, practical, and productive is a dramatic case in point. But so too is his use of the term *epistêmê*, which we first encounter in the *Metaphysics*,

for example, as a near synonym of *technê* or craft knowledge, which is productive not theoretical (I 1 $981^{a}3$).

An Aristotelian science, although a state of the soul rather than a set of propositions in a textbook, nonetheless does involve an affirmational grasp of a set of true propositions (*NE* VI 3 $1139^{b}14$–16). Some of these propositions are indemonstrable starting-points or first principles (*archai*), which are or are expressed in definitions, and others are theorems demonstrable from these starting-points. We can have scientific knowledge only of the theorems, since—exactly speaking—only what is demonstrable can be scientifically known (VI 6). Yet—in what is clearly another lapse from exact speaking—Aristotle characterizes "the most exact of the sciences," which is theoretical wisdom (*sophia*), as also involving a grasp by understanding (*nous*) of the truth where the starting-points themselves are concerned (VI 7 $1141^{a}16$–18). He does the same thing in the *Metaphysics,* where theoretical wisdom is the *epistêmê* that provides "a theoretical grasp of the primary starting-points and causes"—among which are included "the good or the for sake of which" (I 2 $982^{b}7$–10). It is for this reason that the god's grasp of himself through understanding is an exercise of scientific knowledge.

Now each of these sciences, regardless of what group it falls into, must—for reasons having to do with the nature of definition and demonstration—be restricted in scope to a single genus of beings (*Ph.* I 1 $184^{a}1$n). Since being is not itself a genus (*APo.* II 7 $92^{b}14$), as Aristotle goes out of his way not just to acknowledge but to prove (*Met.* IV 2), it apparently follows that there should be no such science as the science of being qua being—as theoretical wisdom. To show that there is one thus takes some work. By the same token, there should be no such science as natural science, but only a collection of distinct sciences, each focused exclusively on its own distinct genus of natural beings.

It is a cliché of the history of philosophy that Aristotle is an empiricist and Plato a rationalist, and like all clichés there is some truth in it. In fact, Aristotle is not just an empiricist at the level of the sciences we call empirical, he is an empiricist at all levels. To see what I mean, think of each of the special, genus-specific sciences—the *first-order* sciences—as giving us a picture of a piece of the world, a region of being. Then ask, what is the world like that these sciences collectively portray? What is the nature of reality as a whole—of being as a whole? If there is no answer besides the collection of special answers, the world is, as Aristotle puts it, episodic—like a bad tragedy (*Met.* XII 10 $1076^{a}1$, XIV 3 $1090^{b}20$). But if there is an answer, it should emerge from a meta-level empirical investigation of the special sciences themselves. As each of these looks for

universals (natural kinds) that stand in demonstrative causal relations to each other, so this meta-level investigation looks for higher-level universals that reveal the presence of common structures of explanation in diverse sciences:

> The causes and starting-points of distinct things are distinct in a way, but in a way—if we are to speak universally and analogically—they are the same for all. . . . For example, the elements of perceptible bodies are presumably: as *form*, the hot and, in another way, the cold, which is the *lack*; and, as *matter*, what is potentially these directly and intrinsically. And both these and the things composed of them are substances, of which these are the starting-points (that is, anything that comes to be from the hot and the cold that is one [something-or-other], such as flesh or bone), since what comes to be from these must be distinct from them. These things, then, have the same elements and starting-points (although distinct things have distinct ones). But that all things have the same ones is not something we can say just like that, although *by analogy* they do. That is, we might say that there are three starting-points—the form and the lack and the matter. But each of these is distinct for each category (*genos*)—for example, in colors they are white, black, and surface, or light, darkness, and air, out of which day and night come to be. (*Met*. XII 4 $1070^{a}31–^{b}21$)

The genus-specific sciences show the presence in the world of a variety of *different* explanatory structures. The trans-generic sciences, by finding commonalities between these structures, show the equally robust presence there of the *same* explanatory structure: form, lack of form, matter.

The science to which form, lack, and matter belong is, in the first instance, trans-generic or universal natural science. It is the one that would be the primary science, as we saw, were there no eternal immovable substances separable from the natural ones. But there is also a trans-generic—or universal—mathematical science:

> We might raise a puzzle indeed as to whether the primary philosophy is universal or concerned with a particular genus and one particular nature. For it is not the same way even in the mathematical sciences, but rather geometry and astronomy are concerned with a particular nature,

> whereas universal mathematics is common to all. (*Met*. VI 1 $1026^{a}23–27$)*

The introduction of intelligible matter (*Met*. VII 10 $1036^{a}11–12$), as the matter of abstract mathematical objects, allows us to see a commonality in explanatory structure between the mathematical sciences and the natural ones. Between these two trans-generic sciences and the theological one (VI 1 $1026^{a}19$), on the other hand, the point of commonality lies not in matter, since the objects of theological science have no matter (XII 6 $1071^{b}20–21$), but rather in form. For what the objects of theology, namely, divine substances (which includes human understanding or *nous*), have in common with those of mathematics and natural science is that they are forms,

*Many theorems in mathematics are special to some branch of it, such as arithmetic or geometry, but there are also "certain mathematical theorems of a universal character" (*Met*. XIII 2 $1077^{a}9–10$). Here is an example: "That proportionals alternate might be thought to apply to numbers qua numbers, lines qua lines, solids qua solids, and times qua times, as used to be demonstrated of these separately, although it is possible to show it of all cases by a single demonstration. But because all these things—numbers, lengths, times, solids—do not constitute a single named [kind] and differ in form from one another, they were treated separately. But now it is demonstrated universally: for what is supposed to hold of them universally does not hold of them qua lines or qua numbers but qua this [unnamed kind]" (*APo*. I 5 $74^{a}17–25$). Nonetheless, the universality of the demonstration is open to challenge on the grounds that lines and numbers differ in genus. For "it is necessary for the extreme and middle terms in a demonstration to come from the same genus" (I 7 $75^{b}10–11$), so that trans-generic demonstrations are ruled out: "it is impossible that what is shown should cross from one genus to another" (I 23 $84^{b}17–18$). Hence "the why [that is, why the theorem about proportionals holds in the case of lines and of numbers] is different" (II 17 $99^{a}8–9$), and so separate demonstrations seem to be needed in the case of each. Nonetheless, "qua such-and-such an increase in quantity" ($99^{a}9–10$) the demonstration is the same, so that the theorem "holds in common of all *quantities*" (*Met*. XI 4 $1061^{b}19–21$). For "while the genera of the beings are different, some attributes belong to quantities and others of qualities alone, with the help of which we can show things" (*APo*. II 32 $88^{b}1–3$). But though the universal theorem holds of all quantities, it does so *by analogy*: "Of the items used in the demonstrative sciences some are special to each science and others common—but common by analogy, since they are only useful in so far as they bear on the genus falling under the science. Proper—for example that a line is such-and-such, and straight so-and-so. Common—for example, that if equals are taken from equals, the remainders are equal" (*APo*. I 10 $76^{a}37–41$). Thus the kind to which lines, numbers, and so on belong, which is the ontological correlate of a theorem of universal mathematics, is not a first-order genus, but an analogical unity—a quantity.

though—and this is the crucial point of difference—not forms in any sort of matter whatsoever. That form should be a focal topic of investigation for the science of being qua being is thus the result of an inductive or empirical investigation of the various genus-specific sciences, and then of the various trans-generic ones, which shows form to be the explanatory feature common to all their objects—to all beings.

It is this empirical fact that provides the science of being qua being with a genuine trans-generic object of study, thereby legitimating it as every bit as much a science as any generic-specific one. The science of being qua being is accordingly a science of form. The question now is how can that science at the same time be theology, the science of divine substance? And to it Aristotle gives a succinct answer:

> If there is some immovable substance, this [that is, theological philosophy] will be prior and will be primary philosophy, and it will be universal in this way, namely, because it is primary. And it will belong to it to get a theoretical grasp on being qua being, both what it is and the things that belong to it qua being. (*Met*. VI 1 $1026^{a}23–32$)

So the primacy of theology, which is based on the fact that theology deals with substance that is eternal, immovable, and separable, is supposedly what justifies us in treating it as the universal science of being qua being.

To get a handle on what this primacy is, we need to turn to being and its structure. The first thing to grasp is that beings are divided into categories: substance, quality, quantity, relation, and so on (*Ph*. I 1 $184^{a}1$n (7)). But of these, only beings in the category of substance are separable, so that they alone enjoy a sort of ontological priority that is both existential and explanatory (I 2 $185^{a}31$n). Other beings are attributes or affections of different sorts, which exist only by belonging to some substance. So if we want to explain what a quality is, for example, we have to say what sort of attribute it is and ultimately what in a substance is receptive of it. It is this fact that gives one sort of unity to beings: they are all either substances or attributes of substances. Hence the famous claim:

> Indeed, the question that was asked long ago, is now, and always will be asked, and is always raising puzzles—namely, What is being?—is just the question, What is substance? . . . And that is why we too must most of all, primarily, and (one might almost say) exclusively get a theoretical grasp on what it is that is a being in this [substantial] way. (*Met*. VII 1 $1028^{b}2–7$)

The starting-points and causes of beings qua beings, then, must be substances. Thus while something is said to be in as many ways as there are categories, they are all so said "with reference to one thing and one nature" (*Met*. IV 2 1003^{a}33–34)—substance. It could still be the case, of course, that the cosmos is episodic like a bad tragedy, made up of lots of separate substances having little ontologically to do with each other, but the number of episodes has at least been systematically reduced.

Before turning to the next phase in being's unification, we need to look more closely at substance itself as it gets investigated and analyzed in *Met*. VII–IX. The analysis begins with a *legomenon*—with something said and accepted quite widely.

> Something is said to be (*legetai*) substance, if not in more ways, at any rate most of all in four. For the essence, the universal, and the genus seem to be the substance of each thing, and fourth of these, the underlying subject. (*Met*. VII 3 1028^{b}33–36)

Since "the primary underlying subject seems most of all to be substance" (*Met*. VII 3 1029^{a}1–2), because what is said or predicated of it depends on it, the investigation begins with this subject, quickly isolating three candidates: the matter, the compound of matter and form, and the form itself (1029^{a}2–3), which is identical to the essence (7 1032^{b}1–2). Almost as quickly (3 1029^{a}7–32), the first two candidates are at least provisionally excluded, leaving form alone as the most promising candidate for being substance. But form is "most puzzling" (1029^{a}33) and requires extraordinary ingenuity and resources to explore.

Aristotle begins the investigation into it with the most familiar and widely recognized case, which is the form or essence present in sublunary matter-form compounds. This investigation is announced in *Met*. VII 3 1029^{b}3–12, but not begun till some chapters later and not really completed till the end of IX 5. By then the various other candidates for being substance have been eliminated or reconceived, and actuality and potentiality have come to prominence. Hence in IX 6 it is with actuality or activity—*entelecheia* or *energeia* (*Ph*. I 2 186^{a}3)—that form, and so substance, is identified, and matter with potentiality.

Precisely because actuality and potentiality are the ultimate explanatory factors, however, they themselves cannot be given an explanatory definition in yet more basic terms. Instead we must grasp them by means of an analogy:

> What we wish to say is clear from the particular cases by induction, and we must not look for a definition of everything, but

> be able to comprehend the analogy, namely, that as what is building is in relation to what is capable of building, and what is awake is in relation to what is asleep, and what is seeing is in relation to what has its eyes closed but has sight, and what has been shaped out of the matter is in relation to the matter, and what has been finished off is to the unfinished. Of the difference exemplified in this analogy let the activity be marked off by the first part, the potentiality by the second. (*Met*. IX 6 $1048^{a}35–^{b}6$)

What is common to matter-form compounds, mathematical objects, and divine substances, then, is actuality. In the case of matter-form compounds and numbers, the actuality is accompanied by potentiality—perceptual sublunary matter in the first case, intelligible matter in the second. In the case of divine substances and other such unmoved movers, it is not. They are "pure" activities or actualities, wholly actual at each moment. Matter-form compounds, by contrast, are never wholly actual—they are always in some way potential. You are actively reading this now, not actively swimming, but you could be swimming, since you have the presently unactivated capacity (or potential) to swim.

The science of being qua being can legitimately focus on form, or actuality, as the factor common to divine substances, matter-form compounds, and mathematical objects. But unless it can be shown that there is some explanatory connection between the forms in these different beings the non-episodic nature of being itself will still not have been established, and the pictures given to us by the natural, mathematical, and theological sciences will, so to speak, be separate pictures, and the being they collectively portray will be divided.

The next stage in the unification of being, and the legitimation of the science dealing with it qua being, is effected by an argument that trades, unsurprisingly, on the identification of form and matter with actuality and potentiality. Part of the argument is given in *Met*. IX 8–9, where the various sorts of priority requisite in a substance are argued to belong to actuality rather than potentiality. But it is in XII 6 that the pertinent consequences are most decisively drawn:

> If there is something that is capable of moving things or acting on them, but that is not actively doing so, there will not [necessarily] be movement, since it is possible for what has a capacity not to activate it. There is no benefit, therefore, in positing eternal substances, as those who accept the Forms do, unless there is to be present in them some starting-point that is capable of causing change. Moreover, even this is not enough, and

> neither is another substance beyond the Forms. For if it will not be active, there will not be movement. Further, even if it will be active, it is not enough, if the substance of it is a capacity. For then there will not be *eternal* movement, since what is potentially may possibly not be. There must, therefore, be such a starting-point, the very substance of which is activity. Further, accordingly, these substances must be without matter. For they must be eternal, if indeed *anything* else is eternal. Therefore they must be activity. (*Met*. XII 6 $1071^{b}12$–22)

Matter-form compounds are, as such, capable of movement and change. The canonical examples of them—perhaps the only genuine or fully fledged ones—are living metabolizing beings (*Met*. VII 17 $1041^{b}29$–30). But if these beings are to be actual, there must be substances whose very essence is activity—substances that do not need to be activated by something else.

With matter-form compounds shown to be dependent on substantial activities for their actual being, a further element of vertical unification is introduced into beings, since layer-wise the two sorts of substances belong together. Laterally, though, disunity continues to threaten. For as yet nothing has been done to exclude the possibility that each compound substance has a distinct substantial activity as its own unique activator. Being, in that case, would be a set of ordered pairs, the first member of which was a substantial activity, the second a matter-form compound, with all its dependent attributes.

In *Met*. XII 8 Aristotle initially takes a step in the direction of such a bipartite picture. He asks how many substantial activities are required to explain astronomical phenomena, such as the movements of the stars and planets, and answers that there must be forty-nine of them ($1074^{a}16$). But these forty-nine are visibly coordinated with each other so as to form a system. And what enables them to do so, and constitute a single heaven, is that there is a single prime mover of all of them:

> It is evident that there is but one heaven. For if there are many, as there are many humans, the starting-point for each will be one in form but in number many. But all things that are many in number have matter, for one and the same account applies to many, for example, humans, whereas Socrates is one. But the primary essence does not have matter, since it is an actuality. The primary immovable mover, therefore, is one both in account and in number. And so, therefore, is what is moved always and continuously. Therefore, there is only one heaven. (*Met*. II 8 $1074^{a}31$–38)

The argument is puzzling, to be sure, since the immateriality that ensures the uniqueness of the prime mover would seem to threaten the multiplicity of the forty-nine movers, since they are also immaterial, nonetheless the point of it is clear enough: what accounts for the unity of the heaven is that the movements in it are traceable back to a single cause—the prime or primary mover.

Leaving aside the question of just how this primary mover moves what it moves directly, which is left unanswered in the *Physics* but discussed in *Met*. XII 7, the next phase in the unification of beings is the one in which the sublunary world is integrated with the already unified superlunary one studied by astronomy. This takes place in *Met*. XII 10, although elements of it have emerged earlier. One obvious indication of this unification is the dependence of the reproductive cycles of plants and animals on the seasons, and their dependence, in turn, on the movements of the sun and moon:

> The cause of a human is both his elements, fire and earth as matter and the special form [as form], and furthermore some other external thing, such as the father, and beyond these the sun and its movement in an inclined circle. (*Met*. XII 10 1071^{a}13–16)

And beyond even that there is the unity of the natural world itself, which is manifested in the ways in which its inhabitants are adapted to each other:

> All things are jointly organized in a way, although not in the same way—even swimming creatures, flying creatures, and plants. And the organization is not such that one thing has no relation to another but rather there is a relation. For all things are jointly organized in relation to one thing—but it is as in a household, where the free men least of all do things at random, but all or most of the things they do are organized, while the slaves and beasts can do a little for the common thing, but mostly do things at random. For this is the sort of starting-point that the nature is of each of them. I mean, for example, that all must at least come to be disaggregated [into their elements]; and similarly there are other things which they all share for the whole. (*Met*. XII 10 1075^{a}16–25)

Just how much unity all this results in—just what it means to speak of "the nature of the whole" (*Met*. XII 10 1075^{a}11) or of the universe as having "one ruler" (1076^{a}4)—is a matter of dispute. The fact remains, though, that the sublunary realm is sufficiently integrated with the superlunary one that

we can speak of them as jointly having a nature and a ruler, and as being analogous not to Heraclitus' "heap of random sweepings," but to an army ($1075^{a}13$) and a household ($1075^{a}22$).

We may agree, then, that the divine substances in the superlunary realm and the compound substances in the sublunary one have prima facie been vertically integrated into a single explanatory system. When we look at the form of a sublunary matter-form compound, then, we will find in it the mark of a superlunary activator, just as we do in the case of the various heavenly bodies, and, as in the line of its efficient causes, we find "the sun and its movement in an inclined circle" (*Met*. XII 7 $1071^{a}15$–16). Still awaiting integration, though, are the mathematical objects, and their next of kin, Platonic forms.

That there is mathematical structure present in the universe can seem to be especially clear in the case of the superlunary realm, just as mathematics itself, with its rigorous proofs and necessary and certain truths, can seem the very paradigm of scientific knowledge. So it is hardly surprising that some of Aristotle's predecessors, especially Pythagoreans and Platonists, thought that the primary causes and starting-points of beings are to be found in the part of reality that is mathematics friendly, or in some way mathematizable. For example, some Platonists (Plato among them, in Aristotle's much disputed view) held that for each kind of sublunary (or perceptible) thing there was an eternal intelligible Form or Idea to which it owed its being, and which owed its own being, in turn, to "the one," as its substance, and the so-called indefinite dyad of the great and the small, as its matter. So when we ask what makes a man a man, the answer will be, because it participates in the Form or Idea of a man, which owes its being to the way it is constructed or generated from the indefinite dyad and the one (*Ph*. IV 2 $209^{b}7$–16, $209^{b}33$–$210^{a}2$). And because the Forms are so constructed, Aristotle says (anyway on one reading of the text) that "the Forms are the numbers" (*Met*. I 6 $987^{b}20$–22). Between these so-called Form (or Ideal) numbers, in addition, are the numbers that are the objects of mathematics: the intermediates. This elaborate system of, as I put it, mathematics-friendly objects, then, are the substances—the ultimate starting-point and causes of beings qua beings.

Against these objects and the ontological role assigned to them, Aristotle launches a host of arguments (thirty-two or so in *Met*. I 9, twenty-four in XIII 8–9, and many others elsewhere), proposing in their place an entirely different account of mathematical objects, which treats them not as substantial starting-points and causes but as abstractions from perceptible sublunary beings—dependent entities, in other words, rather that self-subsistent or intrinsic ones (*Ph*. II 2 $193^{b}31$–35). This completes the vertical and horizontal unification of

being: attributes depend on substances, substantial matter-form compounds depend on substantial forms, or activities, numbers depend on matter-form compounds.

Beings are not said to be "in accord with one thing," then, as they would be if they formed a single genus, but "with reference to one thing"—namely, a divine substance that is in essence an activity. And it is this more complex unity, compatible with generic diversity, and a genuine multiplicity of distinct genus-specific sciences, but just as robust and well grounded as the simpler genus-based sort of unity, that grounds and legitimates the science of being qua being as a single science dealing with a genuine object of study (*Met*. IV 2 $1003^{b}11$–16). The long argument that leads to this conclusion is thus a sort of existence proof of the science on which the *Metaphysics* focuses.

It is the priority of a divine substance with that science that justifies each of the following descriptions of what the *Metaphysics* is about:

> If, then, there is no other substance beyond those composed by nature, natural science will be the primary science. But if there is some immovable substance, this [that is, theological philosophy] will be prior and will be primary philosophy, and it will be universal in this way, namely, because it is primary. And it will belong to it to get a theoretical grasp on being qua being, both what it is and the things that belong to it qua being. (*Met*. VI 1 $1026^{a}27$–32)

> Whether there is, beyond the matter of these sorts of substances, another sort of matter, and whether to look for another sort of substance, such as numbers or something of this sort, must be investigated later. For it is for the sake of this that we are trying to make some determinations about the perceptible substances, since in a certain way it is the function of natural science and second philosophy to have a theory about the perceptible substances. (*Met*. VII 11 $1037^{a}10$–16)

> Since we have spoken about the capacity [or potentiality] that is said [of things] with reference to movement, let us make some distinctions concerning activity, both concerning what it is and what sort of thing. For the capable too will at the same time become clear as we make our determinations, because we do not say only of that which naturally moves something else, or is moved by something else, that it is capable, whether unconditionally or in a certain way, but also use the term in a different

> way, which is why in the course of our inquiry we went through the former. (*Met*. IX 6 1048^{a}25–30)
>
> Concerning the primary starting-points and the primary causes and elements, however, some of what is said by those who speak only about perceptible substance has been discussed in our works on nature, while some does not belong to the present method of inquiry. But what is said by those who assert that there are other substances beyond the perceptible ones is something we need to get a theoretical grasp on next after what we have just discussed. (*Met*. XIII 9 1086^{a}21–26)

The science of being qua being is a sort of theology, as *Met*. II 2 already told us it was, but it is a sort of theology only because of the special role of the primary god among beings.

Is the Investigation in the Physics *a Scientific One?*

If we think of a science in the exact sense as consisting exclusively of what is demonstrable, as we saw Aristotle himself sometimes does, we will be right to conclude that a treatise without demonstrations cannot be scientific. But if, as he also does, we include knowledge of starting-points as parts of science, we will not be right, since a treatise could contribute to a science not by demonstrating anything but by arguing to the starting-points themselves—an enterprise which could not without circularity consist of demonstrations *from* those starting-points. Arguments leading *from* starting-points and arguments leading *to* starting-points are different, we are invited not to forget (*NE* I 4 1095^{a}30–32), just as we are told that because establishing starting-points is "more than half the whole" (I 7 1098^{b}7), we should "make very serious efforts to define them correctly" (1098^{b}5–6). We might reasonably infer, therefore, that the *Physics* is a contribution to universal natural science precisely because it contributes to the correct definition and secure grasp of the starting-points without which no genus-specific natural science can exist.

In our investigation of starting-points, "we must," Aristotle says, "start from things known *to us*" (*NE* I 4 1095^{b}3–4). For the sake of clarity, let us call these *raw starting-points*. These are the ones we start from when we are arguing to *explanatory scientific starting-points*. It is important not to confuse the two. In the case of the special sciences the *explanatory starting-points* include, in particular, definitions that specify the genus and differentiae of the real (as opposed to nominal) universal essences of the

beings with which the science deals (*APo*. II 10 93^{b}29–94^{a}19). Since scientific definitions must be apt starting-points of demonstrations, this implies, Aristotle thinks, that the "extremes and the middle terms must come from the same genus" (I 7 75^{b}10–11). As a result a single canonical science must deal with a single genus (I 28 87^{a}38–39). To reach these definitions from *raw starting-points*, we first have to have the raw starting-points at hand. Aristotle is clear about this, as he is indeed about what is supposed to happen next:

> The method (*hodos*) is the same in all cases, in philosophy as well as in the crafts or any sort of learning whatsoever. For one must observe for both terms what belongs to them and what they belong to, and be supplied with as many of these terms as possible, and one must investigate them by means of the three terms [in a syllogism], in one way when refuting, in another way when establishing something. When it is in accord with truth, it must be from the terms that are catalogued (*diagegramenôn*) as truly belonging, but in dialectical deductions it must be from premises that are in accord with [reputable] belief. . . . Most of the starting-points, however, are special to each science. That is why experience must provide us with the starting-points where each is concerned—I mean, for example, that experience in astronomy must do so in the case of astronomical science. For when the things that appear to be so had been adequately grasped, the demonstrations in astronomy were found in the way we described. And it is the same way where any other craft or science whatsoever is concerned. Hence if what belongs to each thing has been grasped, at that point we can readily exhibit the demonstrations. For if nothing that truly belongs to the relevant things has been omitted from the collection, then concerning everything, if a demonstration of it exists we will be able to find it and give the demonstration, and if it is by nature indemonstrable, we will be able to make that evident. (*APr.* I 30 46^{a}3–27)

Once we have a catalogue of the *raw starting-points*, then, the demonstrative explanation of them from explanatory scientific starting-points is supposedly fairly routine. We should not, however, demand "the cause [or explanation] in all cases alike. Rather, in some it will be adequate if the fact that they are so has been correctly shown (*deiknunai*) as it is indeed where starting-points are concerned" (*NE* I 8 1098^{a}33–^{b}2). But what exactly is it to show a starting-point correctly or adequately?

Aristotle describes natural science as a branch of theoretical philosophy (*Met*. VI 1 1026^{a}18–19) or theoretical science (XI 7 1064^{b}1–3), and to the explanatory scientific starting-points of philosophical sciences, he claims, there is a unique route:

> Dialectic is useful in the philosophical sciences because the capacity to go through the puzzles on both sides of a question will make it easier to discern what is true and what is false in each. Furthermore, dialectic is useful in relation to the primary [starting-points] (*ta prota*) in each science. For it is impossible to say anything about these based on the starting-points properly belonging to the science in question, since these starting-points are, of all of them, the primary ones, and it is through reputable beliefs (*endoxa*) about each that it is necessary to discuss them. This, though, is a task special to, or most characteristic of, dialectic. For because of its ability to stand outside and examine (*exetastikê*), it has a route toward the starting-points of all methods of inquiry. (*Top*. I 2 101^{a}34–^{b}4)

And this is repeated almost word for word in the *Physics* itself with reference to the concept of place, which is a natural scientific starting-point:

> We must try to make our investigation in such a way that the what-it-is is given an account of, so that the puzzles are resolved, the things that are believed to belong to place will in fact belong to it, and furthermore, so that the cause of the difficulty and of the puzzles concerning it will be evident, since this is the best way of showing each thing. (*Ph*. IV 4 211^{a}7–11)

We might notice in this regard that the verb *deiknunai* occurs around fifty times in the *Physics* and the word *aporia* around sixty. Prima facie, then, the *Physics* should correctly show the explanatory starting-points of *universal natural science* by going through puzzles and solving these by appeal to reputable beliefs. But before we rush to the *Physics* to see whether that is what we do find, we need to be clearer about what exactly we should be looking for.

Dialectic is recognizably a descendant of the Socratic elenchus, which famously begins with a question like this: *Ti esti to kalon?* What is the noble? The respondent, sometimes after a bit of nudging, comes up with a universal definition, what is noble is what all the gods love, or whatever it might be (I adapt a well-known answer from Plato's *Euthyphro*). Socrates then puts this definition to the test by drawing attention to some things

that seem true to the respondent himself but which conflict with his definition. The puzzle or *aporia* that results from this conflict then remains for the respondent to try to solve, usually by reformulating or rejecting his definition. Aristotle understood this process in terms that show its relationship to his own:

> Socrates, on the other hand, busied himself about the virtues of character, and in connection with them was the first to inquire about universal definition. . . . It was reasonable, though, that Socrates was inquiring about the what-it-is. For he was inquiring in order to deduce, and the what-it-is is a starting-point of deductions. For at that time there was not yet the strength in dialectic that enables people, and separately from the what-it-is, to investigate contraries, and whether the same science is a science of contraries. For there are two things that may be fairly ascribed to Socrates—inductive arguments and universal definition, both of which are concerned with a starting-point of scientific knowledge. (*Met*. XIII 4 $1078^{b}17$–30; also I 6 $987^{b}1$–4)

In Plato too dialectic is primarily concerned with scientific starting-points, such as those of mathematics, and seems to consist in some sort of elenchus-like process of reformulating definitions in the face of conflicting evidence so as to render them puzzle free (*Rep*. VII 532a1–533d1). Aristotle can reasonably be seen, then, as continuing a line of thought about dialectic, while contributing greatly to its exploration, systemization, and elaboration in works such as *Topics* and *Sophistical Refutations*.

Consider now the respondent's first answer, his first definition: what is noble is what the gods love. Although it is soon shown to be incorrect, there is something quite remarkable about its very existence. Through experience shaped by acculturation and habituation involving the learning of a natural language the respondent is confident that he can say what nobility is. He has learned to apply the word "noble" to particular people, actions, and so on correctly enough to pass muster as knowing its meaning, knowing how to use it. From these particular cases he has reached a putative universal, something the particular cases have in common. But when he tries to define that universal in words, he gets it wrong, as Socrates shows. Here is Aristotle registering the significance of this: "The things that are knowable and primary for particular groups of people are often only slightly knowable and have little or nothing of the being in them. Nonetheless, beginning from things that are poorly known but known to ourselves, we must try to know the ones that are wholly knowable, proceeding, as has just been said, through the former" (*Met*. VII 3 $1029^{b}8$–12).

The route by which the respondent reaches the universal that he is unable to define correctly is what Aristotle calls induction (*epagôgê*). This begins with (1) perception of particulars, which leads to (2) retention of perceptual contents in memory, and, when many such contents have been retained, to (3) an experience, so that for the first time "there is a universal in the soul" (*APo.* II 19 $100^{a}3$–16). The universal reached at stage (3), which is the one the respondent reaches, is described as "rather confused" and "more knowable by perception" (*Ph.* I 1 $184^{a}22$–25). It is the sort of universal, often quite complex, that constitutes a nominal essence corresponding to the nominal definition or meaning of a general term. Finally, (4) from experience come craft knowledge and scientific knowledge, when "from many intelligible objects arising from experience one universal supposition about similar objects is produced" (*Met.* I 1 $981^{a}5$–7).*

The *nominal* (or analytic, meaning-based) definition of the general term "thunder," for example, might pick out the universal *loud noise in the clouds*. When science investigates the things that have this nominal essence, it may find that they also have a real essence or nature in terms of which their other features can be scientifically explained:

> Since a definition is said to be an account of what something is, it is evident that one sort will be an account of what its name, or some other name-like account, signifies—for example, what triangle signifies. . . . Another sort of definition is an account that makes clear why it exists. So the former sort signifies something but does not show it, whereas the latter will evidently be like a demonstration of what it is, differing in arrangement from a demonstration. For there is a difference between saying why it thunders and saying what thunder is. In the first case you will say: because fire is being extinguished in the clouds. And what is thunder? The loud noise of fire being extinguished in the clouds. Hence the same account is given in different ways. In one way it is a continuous demonstration, in the other

*Compare: "Unconditionally, what is prior is more knowable than what is posterior—for example, a point than a line, a line than a plane, and a plane than a solid, just as a unit is more so than a number, since it is prior to and a starting-point of all number. Similarly, a letter is more so than a syllable. To us, on the other hand, it sometimes happens that the reverse is the case. For the solid falls most under perception, the plane more than the line, line more than point. For ordinary people know things of the former sort earlier. For to learn them is a task for random thought, whereas to learn the others is a task for exact and extraordinary thought" (*Top.* VI 4 $141^{b}5$–14).

> a definition. Further, a definition of thunder is a noise in the clouds, and this is a conclusion of the demonstration of what it is. The definition of an immediate item, though, is an indemonstrable positing (*thesis*) of what it is. (*APo*. II 10 $93^{b}29$–$94^{a}10$; compare *DA* II 2 $413^{a}13$–20)

A real (or synthetic, fact-based) definition, which analyzes this real essence into its "elements and starting-points" (*Ph*. I 1 $184^{a}23$), which will be definable but indemonstrable within the science, makes intrinsically clear what the nominal definition made clear only by enabling us to recognize instances of thunder in a fairly—but imperfectly—reliable way. As a result, thunder itself, now clearly a natural and not just a conventional kind, becomes better known not just to us but entirely or unconditionally. These analyzed universals, which are the sort reached at stage (4), are the ones suited to serve as starting-points of the sciences and crafts: "experienced people know the that but do not know the why, whereas craftsmen know the why, that is, the cause" (*Met*. I 1 $981^{a}28$–30).

Socrates too, we see, wanted definitions that were not just empirically adequate but also explanatory: in telling Euthyphro what he wants in the case of piety, he says that he is seeking "the form itself *in virtue of which* all the pieties are pieties" (*Euthphr*. 6d10–11). That is why he rejects the definition of piety as being what all the gods love. This definition is in one way correct, presumably, in that if something is pious it must be loved by the gods and vice versa, but it is not explanatory, since it does not tell us what it is about pious things that makes all the gods love them, and so does not identify the form in virtue of which they are pious (9e–11b).

Let us go back. We wanted to know what was involved in showing a scientific starting-point. We were told how we could *not* do this, namely, by demonstrating it from scientific starting-points. Next we learned that dialectic had a route to it from reputable beliefs. At the same time, we were told that induction had a route to it as well—something the *Nicomachean Ethics* also tells us: "we get a theoretical grasp of some starting-points through induction, some through perception, some through some sort of habituation, and others through other means" (I 7 $1098^{b}3$–4). This suggests that induction and dialectic are in some way or other related processes.

What shows a Socratic respondent to be wrong is an example that his definition does not fit. The presentation of the example might be quite indirect, however. It might take quite a bit of stage setting, elicited by the asking of many questions, to bring out a puzzle. But if it does succeed in doing so, it shows that the universal grasped by the respondent and the definition of it produced by him are not entirely or unconditionally knowable and that his state is not one of clear-eyed understanding:

> A puzzle in thought makes manifest a knot in the subject matter. For insofar as thought is puzzled it is like people who are tied up, since in both cases it is impossible to move forward. That is why we must get a theoretical grasp on all the difficulties beforehand, both for these reasons and because those who inquire without first going through the puzzles are like people who do not know where they have to go. And, in addition, a person [who has not already grasped the puzzles] does not even know whether he has found what he is inquiring into. For to someone like that the end is not clear, whereas to a person who has already grasped the puzzles it is clear. (*Met*. II 1 $995^{a}30$–$^{b}2$)

But lack of such clear-eyed understanding of a scientific starting-point has serious downstream consequences:

> If we are to have scientific knowledge through demonstration, . . . we must know the starting-points better and be better persuaded of them than of what is being shown, but we must also not find anything more persuasive or better known among things opposed to the starting-points from which a contrary mistaken conclusion may be deduced, since someone who has unconditional scientific knowledge must be incapable of being persuaded out of it. (*APo*. I 2 $72^{a}37$–$^{b}4$)

If dialectical examination brings to light a puzzle in a respondent's thought about a scientific starting-point, then, he cannot have any unconditional scientific knowledge even of what he may well be able to demonstrate correctly from it. Contrariwise, if dialectical examination brings to light no such puzzle, he apparently does have clear-eyed understanding, and his route to what he can demonstrate is free of obstacles.

At the heart of dialectic, as Aristotle understands it, is the dialectical deduction (*dialektikos sullogismos*). This is the argument lying behind the questioner's questions, partly dictating their order and content and partly determining the strategy of his examination. In the following passage it is defined and contrasted with two relevant others:

> Dialectical arguments are those that deduce from reputable beliefs in a way that reaches a contradiction; peirastic arguments are those that deduce from those beliefs of the respondent that anyone must know (*eidenai*) who pretends to possess scientific knowledge . . . ; contentious (*eristikos*)

> arguments are those that deduce or appear to deduce from what appear to be reputable beliefs but are not really such. (*SE* 2 165^{b}3–8)

If we think of dialectical deductions in this way, a dialectician, in contrast to a contender, is an honest questioner, appealing to genuinely reputable beliefs and employing valid deductions. "Contenders and sophists use the same arguments," Aristotle says, "but not to achieve the same goal. . . . If the goal is apparent victory, the argument is contentious; if it is apparent wisdom, sophistic" (*SE* 11 171^{b}27–29). Nonetheless, he does also use the term *dialektikê* as the name for the craft that honest dialecticians and sophists both use: "In dialectic a sophist is so called in virtue of his deliberate choice, and a dialectician is so called not in virtue of his deliberate choice, but in virtue of the capacity he has" (*Rh*. I 1 1355^{b}20–21). If dialectic is understood in this way, a dialectician who deliberately chooses to employ contentious arguments is a sophist (I 1 1355^{a}24–^{b}7).* We need to be careful, therefore, to distinguish *honest dialectic* from what we may call *plain dialectic*, which—like all crafts—can be used for good or ill (*NE* V 1 1129^{a}13–17).

The canonical occasion for the practice of the Socratic elenchus, obviously, is the examination of someone else. But there is nothing to prevent a person from practicing it on himself: "How could you think," Socrates asks Critias, "that I would refute you for any reason other than the one for which I would refute myself, fearing lest I might inadvertently think I know something when I don't know it?" (*Chrm*. 166c7–d2). Dialectic is no different in this regard:

> But the philosopher, who is investigating by himself, does not care whether, though the things through which his deduction proceeds are true and knowable, the answerer does not concede them, because they are close to what was proposed at the start, and he foresees what is going to result, but rather is presumably eager for his claims to be as knowable and as close to it as possible. For it is from things of this sort that scientific deductions proceed. (*Top.* VIII 1 155^{b}10–16; compare *Ph*. VIII 8 263^{a}15–23)

*Compare: "There are some things that cannot be put in only one genus—for example, the cheat and the slanderer. For neither the one with the deliberate choice to do it but without the capacity, nor the one with the capacity but not the deliberate choice, is a slanderer or a cheat, but rather the one with both" (*Top*. IV 5 126^{b}8–11).

> An inquiry with another person is carried out by means of words (*logôn*), whereas an inquiry by oneself is carried out no less by means of the things at issue themselves. (*SE* 7 169^{a}38–40)

What we are to imagine, then, is that the philosopher surveys the raw scientific starting-points, constructing detailed catalogues of these. He then tries to formulate definitions of the various universals involved in them that seem to be candidate scientific starting-points, testing these against the raw scientific starting-points by trying to construct demonstrations from them. But these definitions will often be no more than partial: the philosopher is only on his way to complete definitional starting-points, just as the demonstrations will often be no more than proto or nascent demonstrations. The often rudimentary demonstrations that we find in Aristotle's scientific treatises are surely parts of this process of arguing *to* not *from* starting-points. We argue to these in part by seeing whether or to what extent we could demonstrate from them.

So: First, we have the important distinction between dialectic proper, which includes the use of what appear to be deductions from what appear to be reputable beliefs, and honest dialectic, which uses only genuine deductions from genuine reputable beliefs. Second, we have the equally important distinction between the use of dialectic in examining a potentially hostile respondent and its use by the philosopher in a perhaps private pursuit of the truth. Third, we have an important contrast between honest dialectical premises and philosophical ones or scientific ones: honest dialectical premises are reputable beliefs, philosophical and scientific premises must be true and knowable. Fourth, we have two apparently equivalent routes to scientific starting-points, one inductive, which starts from *raw starting-points,* and the other dialectic, which starts from reputable beliefs.

According to the official definition, reputable beliefs are "things that are believed by everyone, by the majority, or by the wise—either by all of them, or by most, or by the most well known and most reputable" (*Top*. I 1 100^{b}21–23). Just as the scientist should have a catalogue of scientific truths at hand from which to select the premises of his demonstrations, so a dialectician ought also to select premises "from arguments that have been written down and produce catalogues (*diagraphas*) of them concerning each kind of subject, putting them under separate headings—for example, 'Concerned with good,' 'Concerned with life'" (*Top.* I 14 105^{b}12–15).

Clearly, then, there will be considerable overlap between the scientist's catalogue of raw starting-points and the honest dialectician's catalogue of reputable beliefs. For, first, things that are believed by reputably wise people are themselves reputable beliefs, and, second, any respondent would accept "the beliefs of those who have investigated the subjects in question—for

example, on a question of medicine he will agree with a doctor, and on a question of geometry with a geometer" (*Top.* I 10 104^{a}8–37). The catalogues also differ, however, in that not all reputable beliefs need be true. If a proposition is a reputable belief, if it would be accepted by all or most people, it is everything an honest dialectician could ask for in a premise, since his goal is simply this: to show by honest deductions that a definition offered by any respondent whatsoever conflicts—if it does—with other beliefs the respondent has. That is why having a complete or fairly complete catalogue of reputable beliefs is such an important resource for a dialectician. It is because dialectic deals with things only "in relation to belief," then, and not as philosophy and science do, "in relation to truth" (I 14 105^{b}30–31), that it needs nothing more than reputable *beliefs*.

Nonetheless, the fact that all or most people believe something leads us "to trust it as something in accord with experience" (*Div. Somn.* 1 426^{b}14–16), and—since human beings "are naturally adequate as regards the truth and for the most part happen upon it" (*Rh.* I 1 1355^{a}15–17)—as containing some truth. That is why having catalogued some of the things that people believe happiness to be, Aristotle writes: "Some of these views are held by many and are of long standing, while others are held by a few reputable men. And it is not reasonable to suppose that either group is entirely wrong, but rather that they are right on one point at least or even on most of them" (*NE* I 8 1098^{b}27–29). Later he generalizes the claim: "things that seem to be so to everyone, these, we say, *are*" (X 2 1172^{b}36–1173^{a}1). Raw starting-points are just that—raw. But when refined some shred of truth is likely to be found in them. So likely, indeed, that if none is found, this will itself be a surprising fact needing to be explained: "when a reasonable explanation is given of why an untrue view appears true, this makes us more convinced of the true view" (VII 14 1154^{a}24–25).* It is the grain of truth enclosed in a reputable belief that a philosopher or scientist is interested in, then, not in the general acceptability of the surrounding husk, much of which he may discard.

The process of refinement in the case of a candidate explanatory starting-point is that of testing a definition of it against reputable beliefs. This may result in the definition being accepted as it stands or in its being altered or modified: when a definition is non-perspicuous, Aristotle tells us at *Top.* VI 13 151^{b}7–8, it must be "corrected and reconfigured (*sundiorthôsanta kai suschêmatisanta*)," until it is made clear. The same process applies to

*Compare: "What we are about to say will also be more convincing to people who have previously heard the pleas of the arguments disputing them" (*Cael.* I 10 279^{b}7–9); "refutations of those who dispute them are demonstrations of the contrary arguments" (*EE* I 3 1215^{a}6–7).

the reputable beliefs themselves, since they may conflict not only with the definition but also with each other. Again, this may result in their being modified, often by uncovering ambiguities within them or in the argument supporting them, or by drawing distinctions that uncover complexities in these, or they may be rejected entirely, provided that their appearance of truth is explained away.

The canonical occasion for the use of honest dialectic, as of the Socratic elenchus and plain dialectic, is the examination of a respondent. The relevant premises for the questioner to use, therefore, are the reputable beliefs in his catalogue that his respondent will accept. Just how wide this set of beliefs is in a given case depends naturally on how accessible to untrained respondents the subject matter is on which he is being examined. We may all have some beliefs about thunder and other phenomena readily perceptible to everyone and which are—for that very reason—reputable. But about fundamental explanatory notions in an esoteric science we may have none at all.

When a scientist is investigating by himself, the class of premises he will select from is the catalogue of *all* the raw starting-points of his science, despite a natural human inclination to do otherwise:

> [People] seem to inquire up to a certain point, but not as far as it is possible to take the puzzle. For it is customary for all of us to make our inquiry not with an eye to the thing at hand but with an eye to the person who says the contrary. For a person even inquires within himself up to the point at which he is no longer able to argue against himself. That is why a person who is going to inquire well must be capable of objecting by means of objections proper to the relevant genus, and this comes from having a theoretical grasp on all the differentiae. (*Cael.* II 13 $294^{b}6$–13)

Hence a scientist will want to err on the side of excess, adding any reputable belief that appears to have any relevance whatsoever to his catalogue. When he formulates definitions of candidate scientific starting-points from which he thinks he can demonstrate the raw ones, he must then examine himself to see whether he really does have the scientific knowledge of it that he thinks he does. If he is investigating together with fellow scientists, others may examine him: we all do better with the aid of co-workers (*NE* X 7 $1177^{a}34$). What he is doing is using honest dialectic on himself or having it used on him. But this, we see, is little different from the final stage—stage (4)—of the induction we looked at earlier. Induction, as we might put it, is in its final stage (possibly self-directed) honest dialectic.

In a famous and much debated passage, Aristotle writes:

> We must, as in the other cases, set out the things that appear to be so, and first go through the puzzles, and, in that way, show preferably all the reputable beliefs about these ways of being affected, or, if not all of them, then most of them and the ones with the most authority. For if the objections are refuted and the reputable beliefs are left standing, that would be an adequate showing. (*NE* VII 1 1145^{b}2–7)

The specific topic of the comment is "these ways of being affected," which are self-control and its lack as well as resilience and softness, as in the parallel passage in the *Physics* that we looked at, namely IV 4 211^{a}7–11, it is about place. Some people think that it applies only to this topic and should not be generalized, even though "as in the other cases" surely suggests a wider scope. And, as we can now see that scope *is* in fact entirely general, since it describes the honest dialectical or inductive route to the starting-points of *all* the sciences and methods of inquiry, with *tithenai ta phainomena* ("setting out the things that appear to be so") describing the initial phase in which the raw starting-points are collected and catalogued.

Now that we know what it means for honest dialectic of the sort employed by the philosopher to provide a route to the explanatory starting-points of the philosophical sciences, we are in a position to see that it is just such a route that the *Physics* takes to those of universal natural science. For nature, cause, place, time, and movement, as well as all the others, are indeed common to all the genus-specific natural sciences and special to none. No wonder, then, that Aristotle himself refers to Book III as *ta peri tas archas*—"the discussion of the starting-points" (*Cael.* I 6 274^{a}21). Since this route is the sort any science must take in order to show its explanatory starting-points, the investigation undertaken in the *Physics* is indeed a scientific one. It is not, to be sure, a demonstration from the starting points of natural science, but rather a showing of the starting-points themselves, which, if successful, allows us to achieve the sort of puzzle-free grasp on them that comes with genuine understanding.

The Audience for the Physics

In the *Nicomachean Ethics*, Aristotle famously tells us that it is not a work for young or immature people, inexperienced in the practical matters with which it deals:

> But each person correctly discerns the things he knows and is a good discerner of these. Hence a person well educated in a given area is a good discerner *in that area*, while a person well educated in all areas is an unconditionally good discerner. That is why a young person is not a suitable audience for politics. For he has no experience of the actions of life, and the accounts are in accord with these and concerned with these. (*NE* I 3 $1094^{b}25–1095^{a}4$)

Though less often recognized, he issues a similar warning in the *Metaphysics*, and there as in the *Ethics*, he makes being well educated a prerequisite:

> That is why we should already have been well educated in what way to accept each argument, since it is absurd to look for scientific knowledge and for the way characteristic of scientific knowledge at the same time—and it is not easy to get hold of either. Accordingly, we should not demand the argumentative exactness of mathematics in all cases but only in the case of things that include no matter. (*Met.* II 3 $995^{a}12–16$)

But whereas in the case of ethics and politics the relevant experience is practical, in metaphysics it is theoretical. There we need experience in life. Here we need experience in the sciences. And in both we need the sort of training in honest dialectic, as in logic and what we would call the philosophy of science, for which the treatises in the so-called *Organon* (*Categories*, *De Interpretatione*, *Prior* and *Posterior Analytics*, *Topics*, and *Sophistical Refutations*) might serve—or might once have served—as a textbook.

Now it is true that there is no comparable warning to be found within the *Physics* itself, which never mentions its intended audience or what it requires of them. But in a passage in the *Nicomachean Ethics* a requirement is explicitly mentioned:

> While young people become geometers and mathematicians and wise in such things, they do not seem to become practically-wise. The explanation is that practical wisdom is concerned also with particulars, knowledge of which comes from experience. But there is no young person who is experienced, since it is quantity of time that produces experience. (Indeed, we might also investigate why it is that a child can become a mathematician but not a theoretically-wise person or a natural scientist. Or isn't it that the objects in mathematics are given through abstraction, while the starting-points in theoretical wisdom or

> natural science come from experience, so that the young lack conviction there but only talk the talk, whereas in mathematics it is quite clear to them what each of the objects is? (*NE* VI 8 1142[a]13–29)

The *Physics*, then, is no more for the inexperienced than the *Nicomachean Ethics* or the *Metaphysics*, although in its case the experience is presumably in the genus-specific natural sciences, Aristotle's own philosophy of science, and in dialectic. The following two passages indicate as much:

> We shall next argue that this is also the only way to resolve the puzzle of the ancient thinkers. For those who were the first to inquire philosophically into the truth and the nature of beings were turned aside, and as it were diverted from their route, by their inexperience, and say that none of the beings either comes to be or passes away, because what comes to be must come to be either from what is or from what is not, both of which are impossible. (*Ph*. I 8 191[a]23–29)

> For even if things are truly in this state, as certain people assert, and being is unlimited and immovable, at least it does not at all appear to be that way according to perception, but instead many beings appear to be in movement. If indeed, then, there is false belief, or belief at all, or even if there is imagination, or if things seem to be sometimes one way and sometimes another way, there is also movement. For imagination and belief seem to be sorts of movements. But to investigate this question at all, and to seek an argument when we are too well off to need an argument, is to be a bad discerner of what is better and what is worse, and what is trustworthy and what is not trustworthy, and what is a starting-point and what is not a starting-point. (*Ph*. VIII 3 254[a]24–33)

There is much in the *Physics*, then, that its readers are supposed to know already. When it is simply information or arguments that are at issue, notes can provide what we need. But there is more to being well educated than being well informed; we must also be the intellectual equivalent of morally virtuous.

When dialectic has done its testing of the opposing sides of a puzzle, we hear in the *Topics*, it "only remains to make a correct choice of one of them" (VIII 14 163[b]11–12). And what enables us to make such a choice is the "naturally good disposition (*euphuia*)" that enables people to "discern

correctly what is best by a correct love or hatred of what is set before them" (163^{b}15–16). The reference to "what is best" suggests that this disposition is the *euphuia* also referred to also in the following passage:

> His seeking of the end in question is not self-chosen, rather, we must be born possessed of a sort of sight by which to discern correctly and choose what is truly good, and a person in whom this by nature operates correctly is naturally well disposed (*euphuês*). For this is what is greatest and noblest and is not the sort of thing we can get from someone else or learn but the sort of thing whose condition at birth is the one in which it will later be possessed and, when it is naturally such as to be in a good and noble condition, will be the naturally good disposition (*euphuia*) in its complete and true form. (*NE* III 5 1114^{b}5–12)

And that, in fact, is what the distinction between philosophy and sophistry, which uses all of plain dialectic's resources, might lead us to expect, since "philosophy differs from dialectic in the way its capacity is employed, and from sophistic in the life it deliberately chooses" (*Met*. IV 2 1004^{b}23–25).

Now a deliberate choice of how to live is at bottom a choice of an ultimate end or target for our life: "everyone who can live in accord with his own deliberate choice should adopt some target for the noble life, whether honor, reputation, wealth, or education, which he will look to in all his actions" (*EE* I 2 1214^{b}6–9). And what "teaches *correct* belief" about this end or target, thereby ensuring that the deliberate choice of it is correct, is "natural or habituated virtue of character" (*NE* VII 8 1151^{a}18–19). It is this, we may infer, in which the naturally good disposition under discussion consists. Hence if we possess it, and it has been properly developed by a good upbringing and education, when we hear from ethics that the starting-point it posits as the correct target for a human life is "activity of the soul in accord with virtue, and if there are more virtues than one, in accord with the best and most complete" (I 7 1098^{a}16–18), we will accept it as true, and so strive to clear away the puzzles in such a way as to sustain its truth. If we do not possess it, we will reject this starting-point, so that in our choice between the conflicting sides of these puzzles, we will go for the wrong ones: "the truth in practical matters must be discerned from the facts of our life, since these are what have the controlling vote. When we examine what has been previously said, then, it must be discerned by bringing it to bear on the facts of our life, and if it is in harmony with the facts, we should accept it, but if it clashes, we should suppose it mere words" (X 8 1179^{a}17–22).

In the *Rhetoric*, we learn of an apparently different sort of good natural disposition which might seem from the company it keeps to be an exclusively intellectual trait: "good natural disposition, good memory, readiness to learn, quick-wittedness . . . are all productive of good things" (I 6 1362^{b}24–25). When it comes to solving dialectical problems bearing on "truth and knowledge," we might conclude, such apparently intellectual good natural disposition is all we need, even if, when it comes to those bearing on "pursuit and avoidance" (*Top*. I 11 104^{b}1–2), we also need its apparently more ethical namesake. It would be a mistake, though, to rush to this conclusion. For the ultimate starting-point and cause that the *Metaphysics* finally uncovers, which is at once the active understanding of active understanding, the prime unmoved mover, and the primary god, is the ultimate cause and starting-point for beings qua beings—*all of them*. And that means that it is our ultimate starting-point and cause too.

When we look at our lives from the outside, so to speak, from the theoretical point of view, if the *Metaphysics* is right, we see something amazing, namely, that the heavenly bodies, those bright denizens of the starry heavens above, are living beings who, like us, are moved by a desire for the best good—for the god (XII 7). When we view our lives from the inside, from that perspective from which "the truth in practical matters" can alone be discerned, the *Ethics* tells us that we will find that we are moved by the same thing—that as the good for the heavenly bodies consists in contemplating the primary god, so too does our happiness: "The activity of a god, superior as it is in blessedness, will be contemplative. And so the activity of humans, then, that is most akin to this will most bear the stamp of happiness" (*NE* X 8 1178^{b}21–23). But Aristotle's hand is tipped also within the *Metaphysics* itself:

> [Active understanding rather than receptive understanding] seems to be the divine element that understanding possesses, and contemplation seems to be most pleasant and best. If, then, that good state [of activity], which we are sometimes in, the [primary] god is always in, that is a wonderful thing, and if to a higher degree, that is yet more wonderful. But that is his state. And life too certainly belongs to him. For the activity of understanding is life, and he is that activity; and his intrinsic activity is life that is best and eternal. We say, then, that the god is a living being that is eternal and best, so that living and a continuous and everlasting eternity belong to the god, since this is the god. (*Met*. XII 7 1072^{b}22–30)

That is why "we should not, in accord with the makers of proverbs, 'think human things, since you are human' or 'think mortal things, since you are mortal' but rather we should as far as possible immortalize, and do everything to live in accord with the element in us that is most excellent" (*NE* X 7 1177^{b}31–34), this being our understanding—our divine *nous*.

Aristotle arrives at this great synthesis of theory and practice, as we saw, on empirical grounds, by reflecting on, and drawing inductive conclusions from, the various sciences—theoretical, practical, and productive—as they existed in his day. He is not doing "armchair" philosophy, but rather drawing on his own vast knowledge of these sciences to reach a unified explanatory picture of being as such and our place in it, as practical agents and theorizers. If we followed in his footsteps, drawing on *our* sciences, from theoretical physics to engineering, economics, and ethics, we would not reach his conclusions about the primary starting-points and causes of beings qua beings. If we are to be Aristotelians now it cannot be by parroting Aristotle's theories. Instead, it must be by taking him as a paradigm of how we might be philosophers ourselves—a "paradigm in the heaven," so to speak, "for anyone who wishes to look at it and to found himself on the basis of what he sees" (Plato, *Rep*. IX 592b1–2).

Physics

Book I

I 1

184ª10 Since in all methodical inquiries in which there is knowledge—that is, scientific knowledge—of things that have starting-points, causes, or elements, it comes from knowledge of these (for we think that we know each thing when we know its primary causes and primary starting-points, all the way to its elements), it is clear that in the scientific knowledge of nature our first task must be to try to determine the starting-points.[1]

And the natural route is from things that are knowable and more perspicuous to us to things that are more perspicuous and more knowable by nature, since the same things are not knowable to us as are knowable unconditionally.[2] That is why we must in this way advance from things that are less perspicuous by nature but more perspicuous to us to the things that are more perspicuous by nature and more knowable.

And the things that are in the first instance clear and perspicuous to us are rather confused. It is only later, through a division of these, that we come to know their elements and starting-points. That is why we must proceed from the universals to the particulars.[3] For it is the whole that is more knowable by perception, and the universal is a sort of whole. For the universal embraces many things as parts. The same
184ᵇ10 thing happens in a way with names in relation to their account. For a name like "circle" signifies a sort of whole in an undivided way, whereas the definition divides it into its particular [elements].[4] And children at first suppose all men to be their fathers and all women their mothers, only later coming to divide up each of them.[5]

I 2

There must, then, be either one starting-point or several, and, if one, it must be either immovable, as Parmenides and Melissus say, or in movement, as the physicists say, of whom some state air to be the primary starting-point, others water.[6] But if there are several, they must be either limited in number or unlimited, and, if limited, but more than one, then either two, three, four, or some other number, whereas if there are an unlimited number, then either they are, as Democritus held, one in genus but differing in shape or in species, or they are also contraries.[7]

Those who inquire into how many beings there are inquire in a similar way.[8] For they are inquiring about the primary things of which the beings are composed, as to whether they are one or many, and if many, whether limited or unlimited in number.[9] So they are [really] inquiring about whether the starting-points or elements are one or many.

Now to investigate whether being is one and immovable is not to make an investigation concerning nature. For just as a geometer has no further argument against someone who does away with the starting-points of geometry—this being a matter for another science or one that is common to all—so it is too where starting-points are concerned.[10] For there will no longer be a starting-point if being is one thing only, and one in this way, since a starting-point must be a starting-point of some thing or things.

To investigate, then, whether being is one in this way is like dialectically discussing any other thesis that is stated for the sake of argument, like that of Heraclitus, or (if anyone were to state it) that being is one human being, or like refuting a contentious argument—which is just what the arguments of Melissus and Parmenides involve.[11] For in fact they assume falsehoods and argue invalidly—or rather, the argument of Melissus is crude and involves no puzzle.[12] Grant him one absurdity and the others follow—nothing difficult in this.[13]

As for ourselves, we must assume that the things that are by nature are in movement, either all of them or some of them. And this is clear from induction.[14] At the same time, we should not resolve every [contentious argument] at hand, but those that involve false demonstration from the starting-points, and not those that do not.[15] For example, it belongs to the geometer to refute a quadrature by means of segments, but not one like Antiphon's.[16] Nevertheless, although they [Melissus and Parmenides] are concerned with nature, but the puzzles they speak about are not natural scientific ones, perhaps it would be good to discuss them briefly, since the investigation involves philosophy.[17]

The starting-point that is most proper of all [to such an investigation] is to see—since something is said to be in many ways—in what way they maintain that all things are one.[18] Do they mean that all are substance, or quantities, or qualities?[19] And, again, do they mean that all are one substance—for example, one human being or one horse or one soul?[20] Or quality, and that it is one—for example, pale, or hot, or something else of that sort?[21] For these are all very different and all impossible to maintain. For if there is to be both substance and quality and quantity, then whether these are detached from each other or not, the beings will be many. If on the other hand everything is quality or quantity, then, whether substances exist or not, something strange

results—if the impossible should be said to be [merely] strange! For none of the others is separable or beyond substance, since all of them are said of an underlying subject—the substance.[22]

Now Melissus says that being is unlimited.[23] Therefore, being is some quantity. For the unlimited is in [the category of] quantity, whereas a substance, quality, or affection cannot be unlimited except coincidentally, that is, if they were at the same time also quantities.[24] For the account of the unlimited makes use of quantity, but not of substance or of quality.[25] If, then, there is substance and quantity as well, being is two, and not one. And if there is substance only, it is not unlimited—in fact, it has no magnitude at all. For if it did, some quantity will have to exist.

Further, since things are said to be one in many ways, just as they are said to be in many, we must investigate in what way they maintain that the universe is one.[26] Now things are said to be one if they are continuous, or indivisible, or if the account of their essence is one and the same, like liquor and booze.[27]

Accordingly, if [1] continuous [is the relevant way of being one], then their being is many, since the continuous is divisible without limit.[28]

There is, however, a puzzle about part and whole—although not perhaps relevant to the argument, but an intrinsic one—as to whether part and whole are one or several, and in what way one or several, and if several, in what way several. (And [the same puzzle arises] about parts that are not continuous.) Also, if each of two parts is one with the whole, as being indivisible from it, [there is the puzzle] that they will also be one with each other.

But then if [2] it is as being indivisible [that their one is one], then in nothing at all will there be a quality or a quantity, nor will being be unlimited, as Melissus says, or limited, as Parmenides does.[29] For it is limits that are indivisible, not limited things.[30]

But then if all beings are one in account, like clothing and apparel, then it follows that they are stating the Heraclitean argument.[31] For the being for good and for bad, for good and for not good, will be the same, so that to be good and to be not good, to be human and to be horse, will be the same, and their argument will be, not that all beings are one, but that they are nothing at all—and the being for such-and-such quality and for such-and-such quantity will be the same.[32]

Even the more recent of the ancient thinkers were causing a disturbance lest the same thing should turn out to be both one and many at the same time. That is why some of them, like Lycophron, did away with the "is," while others remodeled the language, and said not "the

human is pale" but "the human has paled," and not "the human is walking" but "the human walks," lest by adding the "is" they would make the one be many—as if things were said to be or to be one in only one way.[33] The beings, however, are many, either in account (for example, being for pale is distinct from being for musical, although the same thing may be both, and the one therefore many) or by division, like the whole and its parts. And at this point they were already involved in puzzles and agreeing that the one is many—as if it were not possible for the same thing to be both one and many, provided that these are not opposites. For a thing can be one either potentially or actually.[34]

I 3

If we approach the thesis in this way, then, it appears to be impossible for the beings to be one. Also, the arguments on the basis of which these thinkers [try to] show it are not difficult to refute. For both of them—both Melissus and Parmenides—contentiously deduce it.[35]

It is clear, indeed, that Melissus argues fallaciously. For he thinks that if he has as an assumption that whatever comes to be has a starting-point, he also has that whatever has not come to be does not have one.[36] Next, this also is absurd: that in all cases there is a starting-point of the thing—not of the time—and not [merely] of unconditional coming to be but also of alteration, as if change never came about all at once.[37] Next, why is the universe immovable, if it is one? For if a part of it that is one—for example, this water here—can be moving within itself, why can't the universe also be moving within itself?[38] Next, why should there be no such thing as alteration?

Moreover, being cannot be one in species either, except in the sense of what it is composed of (even some of the physicists speak of it as one in this, but not in the former, way). For human is distinct in species from horse, and contraries from each other.[39]

And against Parmenides the ways of arguing—besides any that may be special to him—are the same. In fact, the resolution [of his argument] is in part that it is false and in part that it does not follow. His assumption that things are said to be unconditionally is false, since they are said to be in many ways.[40] As for what does not follow, suppose that there are only pale things and that "pale" signifies one thing, nonetheless the pale things will be many and not one. For the pale will not be one by being continuous, nor by being one in account.[41] For the being for pale will be distinct from the being for its recipient.[42] And there will not be anything beyond the pale that is separable, since they

are not distinct by being separable but because the being for pale and for what it belongs to are distinct.[43] But this Parmenides did not get far enough to see.[44]

He must assume, then, not only that "being" signifies one thing, whatever it is predicated of, but also that it signifies just being and just one.[45] For a coincident is said of some underlying subject, so that if being is a coincident, the underlying subject will not be (for it is distinct from being), and, therefore, there will be something that is not.[46] Just being, then, could not belong to something else. For it would not be possible for it to be a being, unless "being" signifies more than one thing, such that each is a sort of being. But it was assumed that "being" signifies one thing.

If, on the other hand, just being is not a coincident of other things, but other things are coincidents of it, why does "just being" signify being rather than not being? For suppose just being were also pale, but the being for pale were not just being (for even being cannot be a coincident of pale, since what is not just being will not be), then the pale will not be—and not in the sense of not being something-or-other, but of wholly not being.[47] Therefore, just being will not be. For it is true to say that it is pale, but this signified not being.[48] So even "pale" signifies just being. Therefore, "being" signifies more than one thing.

Nor, accordingly, will being have magnitude, if indeed being is just being, since the being of each of the two components would be distinct.

That just being is divided into another just being is evident even from the [definition of an] account.[49] For example, suppose the human is just being, then the animal is also just being, as is the two-footed.[50] For otherwise, they will be coincidents, either present in the human or in some other subject. But this is impossible. For something is said to be a coincident either if it is such that it can belong or not belong, or if that to which the coincident belongs is present in the account of it.[51] For example, being seated is a coincident as separable, and in the snub belongs the account of the nose with which we say the snub is coincident.[52] Further, whatever is present in the definitional account of something, or of which the account is composed, must be such that in the account of it the account of the whole thing is not present—for example, in the two-footed that of the human, or in the pale that of the pale human. Accordingly, if this is the way things are, and if the two-footed is a coincident of the human, then either it must be separable from the human, so that it would be possible for the human not to be two-footed, or else the account of the human would be present in the account of the two-footed. But this is impossible, since the latter is present in the account of it.

If, on the other hand, the two-footed and the animal are coincidents of something else, and if each of them is not just being, then the human too would be a coincident of something else. But we must take it that just being is not a coincident of anything at all, and that if both of two things are said of something, so also must that which they compose. The universe, therefore, will be composed of indivisibles.[53]

Some thinkers did, in fact, give in to both arguments: to the argument that all things will be one if "being" signified one thing, when they posited that not being will exist; and to the argument from the division into two things, when they posited indivisible magnitudes.[54]

It is evident, though, that it is not true that if "being" signifies one thing, and not at the same time the contradictory of this, then not being will not exist. For nothing prevents not being from not being *something*, but from *simply* not being.[55] And it is absurd to say that if nothing else exists beyond being itself, then all things will be one. For who does learn about being itself if there were not something for just being to be?[56] And if that is so, then there is nothing to prevent there being many beings from being, as we said.

It is clear, then, that it is impossible for being to be one in the way claimed.

I 4

The physicists on the other hand state things in two ways. [1] Some make the underlying body one—either one of the three or something else that is denser than fire and rarer than air—and then generate the other things, making them many by means of condensation and rarefaction.[57] Now these are contraries, which taken universally are excess and deficiency, as are the great and the small in Plato, except that he makes these be matter, and the one be form (*eidos*), whereas they make the one the underlying matter and the contraries be differentiae (*diaphora*), that is, forms (*eidos*).[58]

[2] Others say that the contrarieties are present in the one and are segregated out of it—for example, Anaximander speaks like this, as do those, such as Empedocles and Anaxagoras, who say that the beings are one and many.[59] For they too segregate out the others from the mixture.[60] They differ from each other, however, in that Empedocles posits a cycle of mixings and segregations, whereas Anaxagoras posits just one, and Anaxagoras posits an unlimited number both of homoeomerous things and of contraries, whereas Empedocles posits the so-called elements only.[61]

Anaxagoras seems to think that these are unlimited in this way because he accepted as true the common belief of the physicists that nothing comes to be from not being. For it is because of this that they say that "all things were together" and that he makes a thing's coming to be such-and-such a sort of thing an alteration, while they make it aggregation and disaggregation.[62]

Further, there is the fact that contraries come to be from each other. Therefore, they must have been there from the start. For if everything that comes to be must do so either from being or from not being, and if it is impossible for it to come to be from not being (and in this belief all those concerned with nature are agreed), they regarded the remaining alternative as immediately following by necessity, namely, that things come to be from beings that are already present but that, because of the smallness of their volume, are imperceptible to us.[63]

That is why they say that everything has been mixed together in everything: because they saw everything coming to be from everything.[64] But things appear different from one another, and are called by distinct names, depending on what is numerically predominant throughout the mixture of the unlimited particles. For they say that no whole thing is purely pale, dark, sweet, flesh, or bone, but whichever it has most of is what seems to be the nature of the thing.[65]

Now if the unlimited insofar as it is unlimited is unknowable, then the unlimited in number or with respect to magnitude is an unknowable quantity, and the unlimited in form (*eidos*) is an unknowable quality.[66] If, then, the starting-points are unlimited both in number and in form, there can be no knowledge of the things they compose. For we think we have got hold of knowledge of a composite when we know the things it is composed of and what their quantity is.

Further, if a part can be of any size whatsoever in the direction of greatness and of smallness, then it must also be possible for the thing itself be so (by "parts" I mean components present in the whole into which the whole can be divided). If, on the other hand, it is impossible for an animal or a plant to be of any size whatsoever, in the direction of greatness and of smallness, it is evident that none of its parts can be either.[67] For if it could, so similarly could the whole. But flesh and bone and things of that sort are parts of an animal, and fruits are parts of plants. It is clear, therefore, that it is impossible for flesh or bone or any other such thing to be of any size whatsoever, either in the direction of greatness or in the direction of smallness.

Further, if all such things are already present in each other, and do not come to be but instead, being present within, are segregated out; and if they are called [what they are] after whatever there is more of; and if anything can come to be from anything (for example, if water can be segregated out from flesh, and flesh from water); and if every limited body is done away with by [subtracting] a limited body: it is evident that it is not possible for everything to be present in everything. For if flesh is subtracted from water, and if this is done again by segregation from what remains, even if what is subtracted is always smaller, still it will not be smaller than a certain magnitude.[68] So, if the process of segregation comes to a stop, not everything will be present in everything (for there will be no flesh in the remaining water); but if it does not come to a stop, but subtraction is always possible, there will be an unlimited number of equal limited parts in a limited magnitude. But this is impossible.

In addition to these considerations, if every body from which something is subtracted must become smaller, and if flesh is definite in quantity, both in greatness and in smallness, it is evident that from the smallest possible quantity of flesh no body can be segregated out. For otherwise there will be a quantity of it smaller than the smallest possible one. **188ª1**

Further, in each of the unlimited bodies there would be already present unlimited flesh, blood, and brain, not indeed separated from each other, but beings nonetheless, and each unlimited. But this is unreasonable.

The statement that segregation will never [be complete] is not made on the basis of knowledge, but it is correct. For attributes are inseparable.[69] If, then, colors and states were mixed together, if they got segregated out, there would be a pale or a healthy that is not another thing, and is not predicated of a subject either.[70] So *nous* is absurd, since it is seeking impossible things, if indeed it wishes to separate them, although it is impossible to do this, both with respect to quantity and with respect to quality: with respect to quantity, because there is no smallest magnitude; with respect to quality, because attributes are inseparable.[71]

Nor is Anaxagoras correct even about the coming to be of things of the same form.[72] For there is a way in which mud is divided into mud, and a way in which it is not.[73]

Moreover, the way in which bricks come from a house and a house from bricks is not the same as the way in which water and air are and come from each other.[74] Also it is better to assume a smaller number of starting-points, just as Empedocles does.[75]

I 5

All thinkers, then, posit contraries as starting-points, both those who say that the universe is one and not moving (for in fact Parmenides posits hot and cold as starting-points, though he calls them by the names "fire" and "earth"[76]) and those who make use of the rare and the dense. Also, Democritus, who posits plenum and void (saying that the one is present as being, the other as not being), but further posits position, shape, and order.[77] And these are genera of contraries—for example, of position, up and down, in front and behind; of shape, angular and angle-less, straight and curved.

It is clear, then, that all in some way posit contraries as starting-points. And this is reasonable. For the starting-points must come neither from each other nor from other things, and all things must come from them. And to the first contraries these features belong: because they are first they do not come from other things, and because they are contraries they do not come from each other.

But how this conclusion follows must also be investigated by appeal to argument.[78] Let us first take it, then, that no being whatsoever is by nature such as to do or suffer any random thing due to any random thing, nor does anything come to be from just anything, except if one takes a coincidental case.[79] For how could pale come to be from musical, unless musical were coincident with the not pale or with the dark?[80] Instead, pale comes from not pale—and not from any not pale but from dark, or something intermediate between the two. And musical comes to be from not musical—except not from any not musical but from unmusical, or something intermediate between the two, if there is such.

Nor again do things pass away into the first random thing—for example, the pale does not pass away into the musical, except coincidentally, but into the not pale, and not into any random one but into the dark or the intermediate. Similarly too the musical passes away into the not musical, and not into any random one but into the unmusical or into some intermediate, if there is such.

It is also the same in all other cases, since the same account also holds of the beings that are not simple but composite.[81] But because the opposite dispositions have no names, this escapes notice.[82] For in all cases the harmonious must come to be from the unharmonious and the unharmonious from the harmonious, and the harmonious must pass away into the unharmonious, and not into any random one but into the opposite one. And it makes no difference whether we speak of harmony, order, or composition, since it is evident that the account is

the same. Moreover, a house too, and a statue, and any other such thing whatsoever comes to be in the same way. For the house comes to be from the non-combination, or rather division, of these things in this way, and the statue, or anything else that is shaped, comes to be from shapelessness.[83] And each of these things is on the one hand an order, and on the other a sort of composition.[84]

Accordingly, if this is true, everything that comes to be comes to be from, and everything that passes away passes away into, its opposite or an intermediate. But the intermediates are [composed] of contraries—for example, colors from black and white.[85] So all the things that come to be by nature are either contraries or [composed] of contraries.

Up to this point most of the others pretty much followed along with us, as we said earlier.[86] For they all posit the elements and the things they call starting-points as contraries, even if they do so without argument, as if compelled by the truth itself.[87] But they differ among themselves in that some take contraries that are prior, some contraries that are posterior, some contraries that are more knowable by reason, others that are more knowable by perception.[88] For some posit hot and cold as the causes of coming to be, others wet and dry, others odd and even or strife and love, and these differ from each other in the way just stated.[89]

So the starting-points they stated are in one way the same, in another way distinct—distinct in the way that most people believe; the same insofar as they are analogous. For they are taken from the same column of contraries, some of which encompass [others], whereas others are encompassed.[90] In this way, then, they spoke of them as similarly and distinctly, better and worse, and some as more knowable by reason, as we said earlier, others by perception (for the universal is known by reason, the particular by perception, since reason is of a universal, whereas perception is of a particular)—for example, the great and the small are known by reason, the rare and the dense by perception.[91]

It is evident, then, that starting-points must be contraries.

I 6

We must next say whether they are two, three, or more in number. For they cannot be one, since contraries are not one, and they cannot be unlimited, since if they were, being would not be scientifically knowable.[92] Also, in any one genus there is just one contrariety, and substance is one genus.[93] Moreover, it is possible [to generate everything] from a limited number, and it is better to do so from a limited number, like Empedocles, than from an unlimited one. For Empedocles thinks

that he gives an account of all things just as Anaxagoras does from his unlimited number. Further, some pairs of contraries are prior to others, and some come to be from others, such as sweet and bitter, white and black, whereas the starting-points must always remain.[94] It is clear from these considerations that they are neither one nor unlimited in number.

Since, then, the starting-points are limited in number, there is some reason not to make only two of them. For one might raise the puzzle as to how density could be by nature such as to affect rarity, or rarity density, at all. And similarly for any other contrariety whatsoever. For love does not gather strife together and make something from it, nor does strife do so from love, but both affect a third distinct thing. And some thinkers assume more than one such thing from which they construct the nature of the beings.[95]

And in addition to this, if no nature distinct from the contraries is assumed, one may also raise this further puzzle. We never in fact see contraries constituting the substance of the beings. For what is a starting-point ought not to be something that is said of an underlying subject.[96] For if it is, there will be a starting-point of the starting-point. For the underlying subject is a starting-point, and seems to be prior to what is predicated of it.[97] Further, we say that substance is not contrary to substance.[98] How, then, can substance be [composed] from what are not substances? Or how could what is not substance be prior to substance?

That is why, if someone considers both the former argument and this one to be true, he must, if he is going to preserve both, posit some third thing that underlies [the contraries], like the one spoken of by those who say that the universe is one nature, such as water or fire or what is intermediate between the two.[99] What is intermediate, though, seems more [of a starting-point], since fire, earth, air, and water are already involved with contrarieties.[100] That is why indeed those who make the underlying subject something distinct from these—or the ones who of these elements make it air—make it so not without reason.[101] For, of these, air too has the least perceptible differentiae, and after it, water.[102] Yet *all* these thinkers give shape to this one thing by means of contraries, that is, by means of density and rarity and the more and the less.[103] And these taken generally are clearly excess and deficiency, as was stated previously.[104] Indeed this doctrine too—that the one and excess and deficiency are starting-points of the beings—would seem to be an ancient one, except that it is not stated in the same way. For the ancient thinkers made the two active and the one passive, whereas some of the more recent ones

stated the contrary instead, that the one does the affecting and the two the being affected.[105]

There would seem, then, on the basis both of these and other such considerations, that there is some reason to think that the elements are three in number, as we said, but no longer any to think that there are more than three.[106] For one is sufficient for being affected, while, if there are four, there will be two contrarieties, and a separate intermediate nature will be needed for each.[107] If, on the other hand, being [just] two, they can generate things out of each other, then one of the two contrarieties would be superfluous.[108] Moreover, it is impossible for there to be more than one first contrariety. For substance is one genus of being, so that the starting-points can differ only in being prior or posterior to each other, and not in genus. For in any one genus there is always one contrariety, all the other contrarieties seeming to be referred back to one.

It is evident, then, that the elements are neither one in number, nor more than two or three—but whether they are two or three involves, as we said, much puzzlement.[109]

I 7

We shall now give our own account, first discussing all cases of coming to be, since the procedure that is in accord with nature is first to say what is common to all cases, and then to get a theoretical grasp on what is special to each one.[110]

For we say that one thing comes to be from another, indeed, a distinct one from a distinct one, whether speaking about simple things or about compound ones.[111] I mean this: it is possible for the human to become musical, it is possible for the not musical to come to be musical or for the not musical human to come to be a musical human. By a simple thing that comes to be [something], then, I mean the human and the not musical, and by a simple thing that [something is] coming to be, I mean the musical. By a compound one I mean both the thing that comes to be and the thing that comes to be it, whenever we say that the not musical human comes to be a musical human.

In some of these cases we say not only that *this* comes to be [something] but that it comes to be [something] from *this*—for example, musical from not musical—but we do not say it in all cases. For musical does not come from human, but rather a human comes to be musical.

Of simple things that come to be [something], some remain when they come to be [that thing], whereas others do not. For the human remains and is human when he comes to be musical, whereas the not

the contraries must be two in number. In another way, though, this is not necessary, since just one of the contraries, by its absence and presence, is sufficient to produce the change.

As for the underlying nature, it is scientifically knowable by analogy.[119] For as the bronze stands to the statue, the wood to the bed, or as what lacks a shape stands to anything else that has a shape, so the underlying nature stands to a substance, a this something, and a being.[120]

This, then, is one starting-point, although it is neither one nor a being in the way a this something is; another one, the account; and a further one is the contrary of this: the lack.[121] In what way these are two, and in what way more, has been stated above.

First, then, it was stated that only the contraries were starting-points, later, that it was necessary for there to be something else to underlie them, and for the starting-points to be three.[122] And from what we have said just now it is evident what the differentia (*diaphora*) of the contraries is, how the contraries stand to each other, and what the underlying subject is.[123] But whether the form or the underlying subject is substance is not yet clear.[124] However, that the starting-points are three, in what way they are three, and what mode [of being] they have, is clear.[125]

From these considerations, then, we should be able to get a theoretical grasp on how many starting-points there are and what they are.

I 8

We shall next argue that this is also the only way to resolve the puzzle of the ancient thinkers. For those who were the first to inquire philosophically into the truth and the nature of beings were turned aside, and as it were diverted from their route, by their inexperience, and say that none of the beings either comes to be or passes away, because what comes to be must come to be either from what is or from what is not, both of which are impossible.[126] For what is cannot come to be, since it already is, while from what is not nothing can come to be. For there must be some underlying subject [for it to come from].[127] And so, developing the consequences of this, they went on to say that there is no plurality of things but only being itself.

They embraced this belief, then, because of the foregoing considerations. We, on the other hand, say that the claim that something comes to be from what is or from what is not, or that what is or what is not affects something or is affected or comes to be a this of whatever sort, is in one way no different from the claim that the doctor affects

something or is affected, or is or comes to be something from being a doctor. So, since we say this latter thing in two ways, it is clear that we also say "from what is" and "what is affects or is affected" in two ways. **191ᵇ1**

Now a doctor builds a house not insofar as he is a doctor but insofar as he is a builder, and comes to be pale not insofar as he is a doctor but insofar as he is dark. But he cures and comes to be ignorant of medicine insofar as he is a doctor. So, since we in the strictest sense say that a doctor acts on something, is affected by something, or comes to be something from being a doctor, when it is insofar as he is a doctor that he acts on it, is affected by it, or comes to be it, it is clear that to say that "something comes to be from what is not" also signifies this, namely, coming to be from it insofar as it is what is not.

The ancient thinkers abandoned the puzzle through failing to make precisely this distinction, and because of their ignorance of it added so much more ignorance to it that they thought that nothing else comes to be or is [besides being itself], and thus did away with all coming to be whatsoever.

Now we too say, as they do, that nothing unconditionally comes to be from what is not, but that things do, nonetheless, come to be from what is not—for example, coincidentally.[128] For a thing comes to be from the lack, which is intrinsically something that is not, and which is not present in the thing. This, however, causes wonder, and it seems impossible that anything could come to be in this way from what is not.

Similarly, there is no coming to be either from what is or of what is, except coincidentally. But in that way this too can come about, namely, the same way as, for example, if animal comes to be from animal, and a certain sort of animal from a certain sort of animal. For example, if dog came to be from horse.[129] The dog indeed would come to be not only from animal of a certain sort, but also from animal, although not insofar as it is animal, since that belongs already. But if a certain sort of animal is to come to be, not coincidentally, it will not be from animal, and if a certain sort of thing that is, is to come to be, it will not be from a thing that is, nor from a thing that is not. For we have said what "from what is not" signifies: from what is not *insofar as it is what is not*.[130]

Further, we also do not do away with [the principle that] everything either is or is not.

This, then, is one way [of resolving the puzzle], but there is another in that the same things can be said either with respect to a capacity or with respect to an activity.[131] But this has been discussed with more exactness elsewhere.[132]

have been some first underlying subject from which it came to be and is present in it. This, though, is the [material] nature itself, so that it will be before coming to be [which is impossible]. (For by "matter" I mean the first underlying subject of each thing from which it not coincidentally comes to be and which is present in it.) And if it passes away, it will come to this [material nature] at last, so that it will have passed away before it has passed away [which is also impossible].

Now to make an exact determination about the starting-point in terms of form, whether it is one or many, and what it is or they are, is the function of primary philosophy, so it may be set aside till the appropriate time comes for that.[144] But about natural forms, forms capable of passing away, we shall speak in the expositions that follow.[145] **192ᵇ1**

That there are starting-points, then, what they are, and how many in number they are, we may take to be determined in the foregoing way. Let us now proceed after first making a fresh start.

Book II

II 1

Of the beings, some are by nature, while others are due to other causes. Those that are by nature are animals and their parts, plants, and simple bodies—for example, earth, fire, air, and water (for we say that these and things like them are by nature). All these things evidently differ from things that are not composed by nature. For each of them has within itself a starting-point of moving and being at rest—some with respect to place, some with respect to increase and decrease, others with respect to alteration.[146]

A bed, by contrast, or a cloak, or anything else of that kind (*genos*), insofar as each such predicate applies to it—that is, to the extent that it is a product of craft—has no innate impulse to change.[147] But insofar as it is coincidentally made of stone, earth, or a mixture of the two, to that very extent, it *does* have one. This is because nature is a sort of starting-point and cause of moving and being at rest in that to which it belongs primarily, intrinsically, and not coincidentally.[148] (I say "not coincidentally" because, for example, someone who is a doctor might come to be a cause of health to himself. Nonetheless, it is not insofar as he is made healthy that he possesses the craft of medicine, but rather being a doctor and being made healthy are coincident in the same person. That is why they are separated from each other.)

Similarly too with other things that are produced. For none of them has within itself the starting-point of its own production, but in some cases (such as a house and each of the other products of handicraft) the starting-point is in something else and external, whereas in others (those that may be coincidental causes to themselves) the starting-point is in the thing but not intrinsically.[149]

Nature, then, is what has been stated. And things that have this sort of starting-point have a nature. And each of them is a substance.[150] For a substance is a sort of underlying subject, and a nature is always in an underlying subject. And these things are also in accord with nature, as too is whatever belongs intrinsically to them, as spatial movement upward belongs to fire—for this neither is nor has a nature but is by nature and in accord with nature.

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We have stated, then, what nature is, what is by nature, and in accord with nature. That there is such a thing as nature it would be

ridiculous to try to show. For it is evident that there are many beings of the relevant sort. And to show what is evident by means of what is not evident is characteristic of someone who cannot discern what is knowable by means of itself and what is not knowable by means of itself (and it is quite clear that this can happen to someone, since someone who was born blind may deduce things about colors). So for such people it is necessary for the argument to be about [mere] names, [by which] to understand nothing.[151]

It seems to some people that the nature and substance of each of the beings that are by nature is the first component present in it, which is intrinsically unshaped—for example, the wood is the nature of the bed, and the bronze of the statue.[152] It is a sign of this, Antiphon says, that if someone were to bury a bed, and the decomposing material were to acquire the capacity to send up a shoot, what came up would not be a bed but wood—his supposition being that the disposition of the material that is in accord with convention and craft knowledge belong coincidentally to the wood, whereas the substance is what remains continuously while these things happen to it. And if each of these materials is also related to another in the same way (for example, bronze and gold to water, bones and wood to earth, and similarly too with anything else whatsoever), then *that* would be their nature and substance.

That is why some people say that fire is the nature of the beings, some that earth, air, or water is, and others that all of them, others that some of them, are. For whatever any of these people took to be of this sort—whether it was one or more than one—this or these he declared to be the substance of all things, everything else being attributes, states, or dispositions of these, and declared this or these to be eternal, since they do not change from themselves, whereas other things come to be or pass away an unlimited number of times.

In one way, then, something is said to be nature when it is the first underlying matter for each of the things that have within themselves a starting-point of movement and change.

In another way, though, what is said to be nature is the shape—that is, the form—that is in accord with the account. For just as something is said to be [a work of] craft when it is in accord with craft knowledge and produced by craft, so something is said to be [a work of] nature when it is in accord with nature and produced by nature. And as in the one case we would not yet say that a thing is at all in accord with craft if it were only potentially a bed and had not yet the form of a bed, or that it is [a work of] craft, so it is in the case of things composed by nature. For what is only potentially flesh or bone, before it acquires the form

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