CONTENTS

1

Principles of Change

The question of change was of consuming interest to the earliest Greek natural philosophers, who flourished in the cities of Ionia (modern western Turkey) in the sixth century BCE. Where did everything come from? they asked. Can something come from nothing? It seemed clear enough that nothing can come from nothing. But for some this meant that there can therefore be no starting point, no absolute beginning or first moment of creation; while for others (Parmenides and the Eleatic school) it suggested, counterintuitively to experience, that there was no possibility of genesis or change at all.

Traditional Greek myths proposed that everything began from a transcendent starting point such as a god or supernatural element. The notion of an eternal regress was unappealing to most Greeks; and the wholesale denial of change contradicted the phenomena of daily life. From observation of the world around them, the earliest thinkers sought a different, nonmythical, solution to the question of the "first principle" (*archē*). Many of these thinkers, who were called in their time "physical" philosophers (i.e., students of nature, *physis*), came up with variations of the idea that the universe in all its multiplicity must have arisen from a single natural element that underlies all creation.

What could that prime element be? The first "physical philosopher" to be identified by Aristotle, Thales of Miletus, claimed that it was water. The fact that water is essential to life,

growth, and health, and is found in visibly different forms—liquid, vapor, snow, and ice—makes it a plausible choice. But subsequent thinkers declared that there must be a yet more fundamental element: Anaximenes identified it as air; Heraclitus thought it was fire. A different kind of solution was proposed by Anaximander, who argued that the origin of everything was an abstract principle that he called "the Limitless."

The choice of early philosophers to identify the ground of being with a single element (on account of which these thinkers are called "monists") raised evident problems. How could any single element give rise to the different ones? How can water turn into fire, air into earth? Could "the Limitless" have given rise to any of these elements? In the early fifth century, Parmenides of Elea concluded that the very notion of change was illogical and illusory. His

contemporary, the Sicilian Empedocles of Acragas, took a different view, proposing that four basic elements—water, air, fire, and earth—were fundamental to creation, and that the universe consists of innumerable transformations of these prime elements. Just as plants exist and grow by using all four elements earth, air, sun, and water, everything in the world must derive from these as they combine with and separate from each other: Empedocles named the combining force Love, and the separating force Strife.

Empedocles calls these elements the "roots" of the cosmos. On his account, the four fundamental roots of being interact to give rise to the myriad multiplicity of the universe. While the term "radical" innovation (from the Latin for "root," radix) nowadays implies a novelty with no basis in what has gone earlier, logically (as Aristotle was to affirm) the new can arise only

out of preexisting elements. "Radical" novelty, then, should not be used to designate something that is new roots and all, but only something that is new from the roots up. Figuratively speaking, the roots are hidden in the earth, while what's new is the growth that is visible above the ground.

A generation after Empedocles, Democritus proposed that the universe is made from tiny particles that he called atoms (from *atoma*, "indivisibles"). On his theory, these are what combine to form the material world. His physical views were propagated by the third-century BCE philosopher Epicurus of Samos and were given magnificent expression in the great philosophical poem in Latin *De Rerum Natura* (*On the Nature of Things*) by the first-century BCE Roman poet Lucretius. Modern physics agrees with Democritus, but his theory didn't seize the popular imagination in ancient times. For

millennia after Empedocles, people found it easier to suppose that everything in the universe was a product of the four elements he had identified and their infinite combinations.

In the fourth century BCE, Aristotle followed the philosophical teachings of Plato with physical and scientific as well as ethical investigations, in which he sought to articulate and analyze the notions of change and innovation in various domains, in particular those of the natural world and the arena of politics and society. Aristotle's discussion of physical change in *Physics* is characteristically spare and

dry since he was concerned to present rigorously compelling arguments. His discussion, the tone of which the chosen selection gives a flavor, refutes Parmenides's negation of change by arguing that coming-to-be requires positing an underlying entity ("what is"). From this a new structure emerges, which both relates to the previous entity and alters it. For purposes of creating something new, the key point that arises from this discussion is that, in practice as well as in logic, change cannot take place without the existence of some underlying thing that will be the subject of that change.

[A] ζητοῦντες γὰρ οἱ κατὰ φιλοσοφίαν πρῶτοι τὴν ἀλήθειαν καὶ τὴν φύσιν τὴν τῶν ὄντων ἐξετράπησαν οἷον ὁδόν τινα ἄλλην ἀπωσθέντες ὑπὸ ἀπειρίας, καί φασιν οὔτε γίνεσθαι τῶν ὄντων οὐδὲν οὔτε φθείρεσθαι, διὰ τὸ ἀναγκαῖον μὲν εἶναι γίγνεσθαι τὸ γιγνόμενον ἢ ἐξ ὄντος ἢ ἐκ μὴ ὄντος, ἐκ δὲ τούτων ἀμφοτέρων ἀδύνατον εἶναι· οὔτε γὰρ τὸ ὂν γίνεσθαι (εἶναι γὰρ ἤδη), ἔκ τε μὴ ὄντος οὐδὲν ἂν γενέσθαι· ὑποκεῖσθαι γάρ τι δεῖ. καὶ οὕτω δὴ τὸ ἐφεξῆς συμβαῖνον αὔξοντες οὐδ᾽ εἶναι πολλά φασιν ἀλλὰ μόνον αὐτὸ τὸ ὄν.

The Logic of Change

Physics *1, Chapter 8, 191a23–b34*

[A] The earliest philosophers were misled in their search for truth and the nature of things by their naive outlook, which led them down a blind alley. They claimed that nothing can either come to be or cease to be, on the grounds that what comes to be must do so either from what is or from what is not. In their view neither of these is possible, since on the one hand what exists cannot come into existence because it already exists, and on the other nothing can come into existence from nothing—there must be something preexistent. They took the consequence of this to extremes, concluding that a plurality of things cannot exist, but only being itself.

9

[B] ἐκεῖνοι μὲν οὖν ταύτην ἔλαβον τὴν δόξαν διὰ τὰ εἰρημένα· ἡμεῖς δὲ λέγομεν ὅτι τὸ ἐξ ὄντος ἢ ἐκ μὴ ὄντος γίνεσθαι, ἢ τὸ μὴ ὂν ἢ τὸ ὂν ποιεῖν τι ἢ πάσχειν, ἢ ὁτιοῦν τόδε γίνεσθαι, ἕνα μὲν τρό-πον οὐδὲν διαφέρει ἢ τὸ τὸν ἰατρὸν ποιεῖν τι ἢ πάσχειν, ἢ τὸ ἐξ ἰατροῦ εἶναί τι ἢ γίγνεσθαι· ὥστε, ἐπειδὴ τοῦτο διχῶς λέγεται, δῆλον ὅτι καὶ τὸ ἐξ ὄντος καὶ τὸ ὂν ἢ ποιεῖν ἢ πάσχειν.

[C] οἰκοδομεῖ μὲν οὖν ὁ ἰατρὸς οὐχ ᾗ ἰατρὸς ἀλλ᾽ ᾗ οἰκοδόμος, καὶ λευκὸς γίνεται οὐχ ᾗ ἰα-τρὸς ἀλλ᾽ ᾗ μέλας· ἰατρεύει δὲ καὶ ἀνίατρος γί-νεται ᾗ ἰατρός. ἐπεὶ δὲ μάλιστα λέγομεν κυρίως τὸν ἰατρὸν ποιεῖν τι ἢ πάσχειν ἢ γίγνεσθαι ἐξ ἰα-τροῦ, ἐὰν ᾗ ἰατρὸς ταῦτα πάσχῃ ἢ ποιῇ ἢ γίνηται,

[B] This was what they argued, and the reason for their conclusions; but I would explain it thus. For something to come from what is or from what is not, or for either of the latter to act, be acted on, or become an identifiable thing, is akin to a doctor doing something, having something done to him, or being or becoming something from being a doctor. These propositions about the doctor can be understood in different ways, just as can the propositions about something "becoming from what is," and "doing something or having something done to."

[C] If a doctor builds a house, he does so not in his capacity as a doctor, but as a builder. If he becomes gray haired, he does so not in his capacity as a doctor but as someone who was previously dark haired. However, if he administers medicine, or fails to do so correctly, he does this in his capacity as a doctor. It's appropriate

δῆλον ὅτι καὶ τὸ ἐκ μὴ ὄντος γίγνεσθαι τοῦτο ση-
μαίνει τὸ ᾗ μὴ ὄν.

[D] ὅπερ ἐκεῖνοι μὲν οὐ διελόντες ἀπέστησαν,
καὶ διὰ ταύτην τὴν ἄγνοιαν τοσοῦτον προση-
γνόησαν ὥστε μηθὲν οἴεσθαι γίγνεσθαι μηδὲ
εἶναι τῶν ἄλλων, ἀλλ᾽ ἀνελεῖν πᾶσαν τὴν γένε-
σιν.Ἡμεῖς δὲ καὶ αὐτοί φαμεν γίγνεσθαι μὲν
οὐδὲν ἁπλῶς ἐκ μὴ ὄντος, πῶς μέντοι γίγνεσθαι
ἐκ μὴ ὄντος, οἷον κατὰ συμβεβηκός· ἐκ γὰρ τῆς
στερήσεως—ὅ ἐστι καθ᾽ αὑτὸ μὴ ὄν—οὐκ ἐνυ-
πάρχοντος γίγνεταί τι· θαυμάζεται δὲ τοῦτο καὶ
ἀδύνατον οὕτω δοκεῖ γίγνεσθαί τι ἐκ μὴ ὄντος.

to say that a doctor does something, or undergoes something, or becomes something from being a doctor, only if it is as a doctor that he does, undergoes, or becomes something else. It's clear, then, that we should say the same thing about coming to be something from what-is-not, which is to say, that this means from what-is-not in the capacity of what-is-not.

[D] Failure to make this distinction led thinkers astray, until they came to suppose that nothing comes to be or exists apart from what it is itself; so they ruled out coming-to-be altogether. While I agree that nothing can be said in an unqualified sense to come from what is not, I say that a thing may in a qualified sense come to be from what is not, that is, by happenstance. The reason is that a thing comes to be from a lack of being something. That lack is by nature something that is not, which does not

[E] ὡσαύτως δὲ οὐδ᾽ ἐξ ὄντος οὐδὲ τὸ ὂν γίγνεσθαι, πλὴν κατὰ συμβεβηκός· οὕτω δὲ καὶ τοῦτο γίγνεσθαι τὸν αὐτὸν τρόπον οἷον εἰ ἐκ ζῴου ζῷον γίγνοιτο, καὶ ἐκ τινὸς ζῴου τὶ ζῷον (οἷον εἰ κύων ἐξ ἵππου γίγνοιτο). γίγνοιτο μὲν γὰρ ἂν οὐ μόνον ἐκ τινὸς ζῴου ὁ κύων ἀλλὰ καὶ ἐκ ζῴου, ἀλλ᾽ οὐχ ᾗ ζῷον (ὑπάρχει γὰρ ἤδη τοῦτο)· εἰ δέ τι μέλλει γίγνεσθαι ζῷον μὴ κατὰ συμβεβηκός, οὐκ ἐκ ζῴου ἔσται· καὶ εἴ τι ὄν, οὐκ ἐξ ὄντος, οὐδ᾽ ἐκ μὴ ὄντος· τὸ γὰρ ἐκ μὴ ὄντος εἴρηται ἡμῖν τί σημαίνει, ὅτι ᾗ μὴ ὄν. ἔτι δὲ καὶ τὸ εἶναι ἅπαν ἢ μὴ εἶναι οὐκ ἀναιροῦμεν.

persist in the event of change. This is what puzzles people who think it impossible that something should come to be from what is not.

[E] In the same way nothing can come from what is and nothing can come to be what is, except by happenstance. That is how something comes to be, as when an animal comes to be from an animal, and an animal of a particular kind from an animal of a particular kind—dog from dog, or horse from horse. A dog would then come to be from an animal as well as from a particular animal, but as it already has the property of being an animal it does not *become* an animal. If anything is to become an animal, where being an animal is not just a coincidental property, it will not do so from already being an animal. If something is to become something that is, it cannot do so from something that it is already. Nor can it come from what-is-not, because (as I have explained) "from what-is-not"

[F] εἷς μὲν δὴ τρόπος οὗτος, ἄλλος δ᾽ ὅτι ἐν-δέχεται ταὐτὰ λέγειν κατὰ τὴν δύναμιν καὶ τὴν ἐνέργειαν· τοῦτο δ᾽ ἐν ἄλλοις διώρισται δι᾽ ἀκρι-βείας μᾶλλον.

[G] ὥσθ᾽ ὅπερ ἐλέγομεν αἱ ἀπορίαι λύονται δι᾽ ἃς ἀναγκαζόμενοι ἀναιροῦσι τῶν εἰρημένων ἔνια· διὰ γὰρ τοῦτο τοσοῦτον καὶ οἱ πρότερον ἐξετράπησαν τῆς ὁδοῦ τῆς ἐπὶ τὴν γένεσιν καὶ φθορὰν καὶ ὅλως μεταβολήν· αὕτη γὰρ ἂν ὀφθεῖσα ἡ φύσις ἔλυσεν αὐτῶν πᾶσαν τὴν ἄγνοιαν.

means "from something that is not in the capacity of what-is-not." This allows us to preserve the principle that everything either is or is not.

[F] This is one way of resolving the problem. Another consists in showing how the same things can be spoken of in terms of potentiality and actuality, as I have done in detail elsewhere.

[G] So, to conclude, I have now resolved the difficulties that forced people to rule out some of the things I have argued are the case. This was what led some earlier thinkers to misconstrue totally the question of coming to be, ceasing to be, and change generally. If they had grasped the point of this underlying nature, their misunderstandings would have been dispelled.