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# NECESSITY, CHANCE, AND FREEDOM IN THE EARLY ATOMISTS

LOWELL EDMUNDS

## I. NECESSITY

### A. *The Problem. Leucippus*

Fortune, which Democritus so disparaged, had the last laugh on the laughing philosopher when through the fragmentation of his work it obscured a cardinal principle of the atomist system, necessity. Or would Democritus have called this the *fatum libellorum*? At any rate, the obscurity of this principle is immediately apparent, both in the ancient doxographical tradition and in modern scholarship. Without endorsing any of the views which variously identify necessity with some one characteristic of the atoms, their weight or aboriginal motion, or with the void they move in,<sup>1</sup> one can yet attempt to undo the identification of necessity with the famous “whirl” of the atoms<sup>2</sup> and to see necessity as a single concept of which the causal operation in the system is uniform. Even Zeus was subject to necessity, and one might think of Democritus as refining and systematizing an ancient belief, in the same way that in making τὸ φρονεῖν physical he subscribed, says Theophrastus, to a “most antique opinion,” to which all the poets and sages adhered.<sup>3</sup>

“Necessity” occurs in none of the B fragments of Democritus con-

<sup>1</sup>E. Zeller, *A History of Greek Philosophy*, trans. S. F. Alleyne (London 1881) 239, considered the gravitation of the atoms to be the fundamental form of necessity. No one, so far as I know, has identified necessity with the void, yet it might seem that the void is as important an aspect of causal necessity as any other; and in fact, if one views atomism against the background of the Eleatics, the void was the crucial atomist hypothesis, which permitted the elaboration of the system: W. K. C. Guthrie, *A History of Greek Philosophy* 2 (Cambridge 1965) 389–392. I am grateful to an anonymous referee for the suggestion that, if the void is the cause of motion (cf. Guthrie, *op. cit.* 396–399), then the necessity of the atoms’ motion so caused is in fact coeval with the void.

<sup>2</sup>Cyril Bailey, *The Greek Atomists and Epicurus* (Oxford 1928) spoke of necessity as the cause of the eternal motion of the atoms (133), but the whirl deserved the “title of necessity *par excellence*” (139). It is to Bailey’s credit, however, that he did not, in thus following D.L. 9.45 (= 2.84.18–19), take the further step of identifying necessity and the whirl. Cf. J. Ferguson, “ΔΙΝΟΣ,” *Phronesis* 16 (1971) 102: “Necessity then means physical or natural law, and that is identified with the vortex which initiates the process;” cf. 115(d). For similar emphasis on the whirl, see G. S. Kirk and J. E. Raven, *The Presocratic Philosophers* (Cambridge 1964) 411.

<sup>3</sup>*De Sensibus* 72 *init.*

cerning his physical system but in one of the B fragments of Leucippus: οὐδὲν χρήμα μάτην γίνεται, ἀλλὰ πάντα ἐκ λόγου τε καὶ ὑπ' ἀνάγκης.<sup>4</sup> Leucippus, then, used the concept to explain how things come into being. Other testimonia stress the connection of necessity with generation and corruption, and also complain of the obscurity of the concept. Diogenes Laertius says that Leucippus maintained that “as the generations of the cosmos, so were the increases, dwindlings and destructions, according to a certain necessity, the quality of which he did not make clear.”<sup>5</sup> Leucippus’ obscurity as regards the character of necessity is also complained of by Hippolytus: “he says that worlds come into being in the following manner: whenever many bodies gather and flow together out of the surrounding into a great void, those that are of like shape and similar in their form knock against one another and join together, and when they have joined together stars come into being, and increase and dwindle through the well-known [such I think is the correct translation of τῆν in the phrase διὰ τῆν ἀνάγκην]<sup>6</sup> necessity. But what this necessity might be, he did not establish.”<sup>7</sup>

Thus the single B fragment and the testimonia suggest that Leucippus used the concept of necessity especially in connection with generation and corruption. One must agree that it is difficult to see, for example, what is the relation of this necessity to the pre-cosmic state: is the necessity immanent in the pre-cosmic state or does it supervene upon that state? If the latter, why and how? Thus perhaps the complaints of Diogenes and Hippolytus. If the former, how is the necessity immanent in the pre-cosmic state—as a quality of the atoms or of the void or of motion or of all of these? But if necessity applies to the whole of the atomists’ hypothesis, so that the pre-cosmic state, any given cosmos, and the destruction of any given cosmos are all equally necessary, why should any one of these states prevail? Perhaps the atomists would reply that none of these states really does prevail: there is only the appearance of a cosmos. It is always changing, like the phenomena within the cosmos which our senses mistakenly report to us as being the same and unchanging. Yet something must be the source of the appearance of the cosmos, and this is an aggregate of atoms. Why then was this aggregate of atoms necessary

<sup>4</sup> 80.5–6. I shall cite the testimonia in H. Diels and W. Kranz, *Die Fragmente der Vorsokratiker*<sup>13</sup> (Zurich 1966) by volume, page, and line number(s).

<sup>5</sup> 71.20–21.

<sup>6</sup> On this translation of the definite article, see Kühner-Gerth, *Ausführliche Grammatik der gr. Sprache*<sup>3</sup> (Hannover and Leipzig 1898), Zweiter Teil, Erster Bd., p. 598. Cf. K. J. Dover, in Gomme-Andrewes-Dover, *A Historical Commentary on Thucydides 4* (Oxford 1970) 366 (on 6.92.3).

<sup>7</sup> 74.26–29.

if the pre-cosmic or pre-aggregated state of the atoms was equally necessary?<sup>8</sup> We have returned to the original dilemma.

### B. Democritus. *The Whirl. Motion*

In order to explain cosmogony, the atomists used the concept of the whirl. In the testimonia, this whirl is especially associated with necessity<sup>9</sup> (though necessity is often spoken of without reference to the whirl). Therefore commentators have thought that cosmogony could not occur without the whirl.<sup>10</sup> But the tradition is ambiguous. Simplicius, who in his commentary on the *Physics* preserves one of our two B fragments on the whirl, can also give the Democritean account of coming into being in terms of atomic shapes and motion, without reference to the whirl:

the atoms are at war with one another as they move along in the void owing to their dissimilarity and their other differences, and as they move they collide and are interlaced in a manner which makes them touch and be near to one another, but never really produces any single existence out of them: for it is quite absurd to suppose that two or more things could ever become one. The reason why the atoms for a certain time remain in combination . . . he believes to be because they fit into and grasp one another: for some of them have uneven sides, and some are hooked, some are concave, and some convex and others with innumerable varieties of shape. He thinks then that they retain hold of one another and remain in combination until some stronger necessity from whatever surrounds them comes and shakes them and scatters them apart. And he speaks of this coming into being and its opposite separation not merely with reference to animals, but also plants and worlds and generally about all perceptible bodies.<sup>11</sup>

The emphasis here is all on the shapes. That Democritus did in fact give an account of cosmogony independent of the whirl can be shown by a comparison of Aristotle's report of the Democritean cosmogony with a passage of Democritus preserved by Sextus:

Aristotle, *Phys.* 196a 24–28

Εἰσι δὲ τινες οἱ καὶ τοῦρανοῦ τοῦδε καὶ τῶν κόσμων πάντων αἰτιῶνται τὸ αὐτόματον· ἀπὸ αὐτομάτου γὰρ γίγνεσθαι τὴν δίνην καὶ τὴν κίνησιν τὴν διακρίνασαν καὶ καταστήσασαν εἰς ταύτην τὴν τάξιν τὸ πᾶν.

Some indeed attribute our Heaven and all the worlds to chance happenings, saying that the vortex and shifting that disentangled the chaos and established the cosmic order came by chance.<sup>12</sup>

<sup>8</sup>Cf. Simplicius' *ἰσχυροτέρα τις ἐκ τοῦ περιέχοντος ἀνάγκη* (2.93.37–38); [Plut.] *Strom.* 7 (2.94.22–23).

<sup>9</sup>Sextus (2.105.1–2); Diogenes Laertius (2.84.18–19); Epicurus (2.78.4–6).

<sup>10</sup>Guthrie, *op. cit.* (above, n. 1) 400 ("the kind of vortex-like motion which was believed necessary to create a world"); Bailey, *op. cit.* (above, n. 2) 138.

<sup>11</sup>Simpl. *in Cael.* 294.33 (=2.93.29 ff.). The translation is by Bailey, *op. cit.* (above, n. 2) 138.

<sup>12</sup>The Loeb Library translation by F. M. Cornford (London and Cambridge, Mass. 1957).

Sextus Empiricus, *adv. math.* 7.117 (*DK Vorsokr.* B 164)

‘καὶ γὰρ ζῶια, φησὶν, ὁμογενέσι ζώοις συναγελάζεται ὡς περιστερὰι περιστερὰις καὶ γέρανοι γεράνοις καὶ ἐπὶ τῶν ἄλλων ἀλόγων ὡσαύτως. (ὡς) δὲ καὶ ἐπὶ τῶν ἀψύχων, καθάπερ ὄραν πάρεστιν ἐπὶ τε τῶν κοσκινευομένων σπερμάτων καὶ ἐπὶ τῶν παρὰ ταῖς κυματωγαῖς ψηφίδων· ὅπου μὲν γὰρ κατὰ τὸν τοῦ κοσκίνου δῖνον διακριτικῶς φακοὶ μετὰ φακῶν τάσσονται καὶ κριθαὶ μετὰ κριθῶν καὶ πυροὶ μετὰ πυρῶν, ὅπου δὲ κατὰ τὴν τοῦ κύματος κίνησιν αἱ μὲν ἐπιμήκεις ψηφίδες εἰς τὸν αὐτὸν τόπον ταῖς ἐπιμήκεσιν ὠθοῦνται, αἱ δὲ περιφερεῖς ταῖς περιφερέσιν ὡς ἂν συναγωγόν τι ἐχούσης τῶν πραγμάτων τῆς ἐν τούτοις ὁμοιότητος’. ἀλλ’ ὁ μὲν Δημόκριτος οὕτως.

“Living creatures consort with their kind, as doves with doves, and cranes with cranes, and similarly with the rest of the animal world. So it is with inanimate things, as one can see with the sieving of seeds and with the pebbles on the beaches. In the former, through the circulation of the sieve, beans are separated and ranged with beans, barley-grains with barley, and wheat with wheat; in the latter, with the motion of the wave, oval pebbles are driven to the same place as oval, and round to round, as if the similarity in these things had a sort of power over them which had brought them together.”<sup>13</sup>

Putting aside for a moment the problem of what Aristotle means by τὸ αὐτόματον, a comparison of the two passages (note especially the words underlined) shows that Aristotle was accurately summarizing the physical theory of the atomists and that Democritus’ sieve and waves are analogies for cosmic processes. Furthermore, the fragment of Democritus shows that Aristotle had in mind a distinction between δῖνη and κίνησις. Applying to inanimate things the analogy of animate, Democritus says that we can see the affinity of like for like in two ways—in the sieving of seeds and in the waves’ jostling of littoral pebbles. The two examples are set forth in two prepositional phrases each consisting of ἐπὶ with the genitive. The repetition of the preposition suggests a difference between the two examples.<sup>14</sup> This difference is made explicit in the following sentence, in which the two examples are contrasted by the μὲν—δὲ construction. The contrast is emphasized by the balance of the identically constructed prepositional phrases at the beginning of each main clause (κατὰ τὸν τοῦ κοσκίνου δῖνον ~ κατὰ τὴν τοῦ κύματος κίνησιν).

But both the whirl and the *kinesis* of the two passages have the same function, separation and arrangement. In Aristotle’s summary, τὴν διακρίνασαν κτλ applies to both δῖνη and κίνησις (for the construction, cf. *Thuc.* 2.71.2: γῆν καὶ πόλιν τὴν σφετέραν). In B 164 Democritus speaks of separation and arrangement (διακριτικῶς; τάσσονται) apropos of the *dinos*,

<sup>13</sup>The translation is by Kathleen Freeman, *Ancilla to the Pre-Socratic Philosophers* (Cambridge, Mass. 1948) 107.

<sup>14</sup>H. W. Smyth, *Greek Grammar* (Cambridge, Mass. 1959) 1667a; Kühner-Gerth, *op. cit.* (above, n. 6) 548.

but the context makes it certain that *kinesis* has the same function. *Dinos* and *kinesis* are, then, distinguished by Democritus as two sorts of motion, the one circular and constant, the other undular and serial, which have the same cosmogonical function. It is especially remarkable that Aristotle's coupling of "the whirl and motion" matches the carefully composed fragment B 164, which contrasts these two as distinct means of sorting the atoms. Since the whirl was often associated with necessity, and since it now appears that *kinesis* is coupled with the whirl as an alternative cosmogony, *kinesis* may, equally with the whirl, be considered a function of necessity. The alternative cosmogony is definitely implied in the passage from Simplicius quoted above, and also in Diodorus, who makes the whirl secondary to a cosmogonic motion.<sup>15</sup>

But the fact remains that motion in a non-cosmogonical sense was already a property of the atoms, and a matter of necessity: *ἀεὶ κινεῖσθαι τὰ πρῶτα σώματα*,<sup>16</sup> and the *Stromateis* of pseudo-Plutarch preserves the tradition that "the causes of things that are now coming into being have no beginning, but rather everything, past, present, and future, is *already in the grip of necessity from limitless time beforehand*."<sup>17</sup> We are back at the original dilemma. The eternal, pre-cosmic motion is necessary. Cosmogony is necessary. What is the relationship between these necessities?

They can be reconciled if "necessity" as applied to the pre-cosmic state refers not only to the atoms' motion but to all other aspects of the atomist hypothesis. Thus the multiplicity of the atoms' shapes and their combinations (cf. the passages of Hippolytus and Simplicius quoted above) would be as much a matter of necessity as their motion. As the following passage of Diogenes Laertius shows, these conditions, the shapes and their combinations, in fact create the whirl in which the sorting takes place:

γίνεσθαι δὲ τοὺς κόσμους οὕτω· φέρεσθαι κατ' ἀποτομὴν ἐκ τῆς ἀπείρου πολλὰ σώματα παντοῖα τοῖς σχήμασιν εἰς μέγα κενόν, ἅπερ ἀθροισθέντα δίνην ἀπεργάζεσθαι μίαν, καθ' ἣν προσκρούοντα (ἀλλήλοις) καὶ παντοδαπῶς κυκλούμενα διακρίνεσθαι χωρὶς τὰ ὅμοια πρὸς τὰ ὅμοια. ἰσορρόπων δὲ διὰ τὸ πλῆθος μηκέτι δυναμένων περιφέρεσθαι, τὰ μὲν λεπτὰ χωρεῖν εἰς τὸ ἔξω κενόν, ὡς περ διαττώμενα· τὰ δὲ λοιπὰ συμμένειν καὶ περιπλεκόμενα συγκατατρέχειν ἀλλή-

This is how the worlds are formed. In a given section many atoms of all manner of shapes are carried from the unlimited into the vast empty space. These collect together and form a single vortex, in which they jostle against each other and, circling round in every possible way, separate off, by like atoms joining like. And, the atoms being so numerous that they can no longer revolve in equilibrium, the light ones pass into the empty space outside, as if they were being winnowed; the remainder keep together and, becoming entangled, go on

<sup>15</sup>2.135.4–10.

<sup>16</sup>Arist. *Cael.* 300b9 (=2.76.6).

<sup>17</sup>2.94.21 ff.

λοισ καὶ ποιεῖν πρῶτόν τι σύστημα σφαιροειδές. τοῦτο δ' ὅσον ὑμένα ἀφίστασθαι, περιέχοντ' ἐν ἑαυτῷ παντοῖα σώματα. ὧν κατὰ τὴν τοῦ μέσου ἀντρείσειν περιδινουμένων λεπτόν γενέσθαι τὸν περίξ ὑμένα, συρρέοντων ἀεὶ τῶν συνεχῶν κατ' ἐπίψαυσιν τῆς δίνης.

their circuit together, and form a primary spherical system. This parts off like a shell, enclosing within it atoms of all kinds; and, as these are whirled round by virtue of the resistance of the centre, the enclosing shell becomes thinner, the adjacent atoms continually combining when they touch the vortex.<sup>18</sup>

In passing it should be noted that the expression *διαπτώμενα* does not mean “winnowing” (as in the Loeb translation) but “sieved.” Since *διαπτάω* is so much less common than *κοσκινεύω* (although it is difficult to establish such matters for Greek writers of the time of Diogenes),<sup>19</sup> it may be that Diogenes is here, in his life of Leucippus, using an expression of Leucippus, and that thus Democritus’ analogy of the sieve (B 164) goes back to his master. But the analogy of sieving in Leucippus’ account differs somewhat from the same analogy in Democritus B 164. In the latter, the image of the sieve expresses the joining of like to like. In the former, *διαπτώμενα* refers to a phase following the joining of like to like, in which the lighter atoms are cast off into the void again. If Democritus took the image of the sieve from Leucippus, he used it differently.

But what is of greater concern to the present discussion is the relation of the whirl to the sorting of the atoms. In the passage of Diogenes Laertius just quoted, as in B 164, it might seem that the whirl is a mechanism imposed upon the atoms from without, as form, or formative agent, upon matter. Yet in the last words of B 164 there was the suggestion of an immanent power of similitude, and in Diogenes Laertius the whirl is created by the atoms before it sorts them. In fact, there is other evidence which would cause us to qualify the usual interpretation of the whirl. Simplicius, after Theophrastus, explains that the three differentiae of atoms (*ῥυσμός; τροπή; διαθιγή*) can be the cause of everything else for the following reason: *πεφυκέναι γὰρ τὸ ὅμοιον ὑπὸ τοῦ ὁμοίου κινεῖσθαι καὶ φέρεσθαι τὰ συγγενῆ πρὸς ἄλληλα καὶ τῶν σχημάτων ἕκαστον εἰς ἑτέραν ἐγκοσμούμενον σύγκρισιν ἄλλην ποιεῖν διάθεσιν.*<sup>20</sup> The principle of like to like can, then, be

<sup>18</sup>D.L. 9. 31 in the Loeb Library translation by R. D. Hicks (Cambridge, Mass. and London 1958). For another translation, and discussion, see Guthrie, *op. cit.* (above, n. 1) 406 ff. The difficult *ὑμήν* is discussed by J. Kerschensteiner, “Zu Leukippos A 1,” *Hermes* 87 (1959) 441–448.

<sup>19</sup>*διαπτάω* does not occur in Preisigke, *Wörterbuch der gr. Papyrusurkunden* (Berlin 1925) or in the supplement prepared by Emil Kiessling (Marburg 1966), but *κοσκινεύω* occurs several times. Lampe, *A Patristic Greek Lexicon* has *κοσκινίζω*, *sift*, but not *διαπτάω*. The translation of *διαπτάω* by “winnowing” apparently rests on Plut. *Quaest. Conv.* 693d (see Guthrie, *op. cit.* [above, n. 1] 407, n. 2). Here Plutarch uses *διαπτήσεις*. The context does not make clear the meaning of the word, but surely the translation by LSJ<sup>9</sup> s.v., “sifting,” is more probable than Hicks’ “winnowed.”

<sup>20</sup>2.94.8–10.

seen as immanent, and not something imposed externally and mechanically. Does it follow therefore that, contrary to our evidence, the whirl does not act like a sieve upon the atoms but rather that the aggregation of likes forms the whirl? To pose the alternatives in this way may be misleading. According to a report of Aristotle, Democritus held that there was no difference between agent and patient: *φησὶ γὰρ τὸ αὐτὸ καὶ ὁμοιον εἶναι τὸ τε ποιοῦν καὶ τὸ πάσχον· οὐ γὰρ ἐγχωρεῖν τὰ ἕτερα καὶ διαφέροντα πάσχειν ὑπ' ἀλλήλων, ἀλλὰ κἄν ἕτερα ὄντα ποιῆ τι εἰς ἄλληλα, οὐχ ἢ ἕτερα ἀλλ' ἢ ταῦτον τι ὑπάρχει, ταύτη τοῦτο συμβαίνειν αὐτοῖς.*<sup>21</sup> If this identity of agent and patient is applied to the whirl, then neither should the joining of like to like be considered the cause of the whirl nor should the whirl be considered the cause of the joining of like to like. Neither is imposed upon the other. They occur simultaneously. The image of the sieve might have seemed apt because of the inseparability, as regards the outcome, of the whirling motion and the shapes of the atoms. But “how can we know the dancer from the dance?”

We now see all the more reason why the whirl should not be equated with necessity, and why B 164 can envisage another cosmogony beside the whirl's. Both the whirl and the *kinesis* of B 164 follow from the elective affinities that the atoms possess because of their shapes. We are not then dealing with two distinct but equally necessary motions. The apparently secondary motion of B 164, like the whirl, is continuous with the original motion and indistinct, in a way, from it: cosmogony is simply one appearance which the atoms put on in the course of their eternal jostling. Cosmogony does not require the whirl. The whirl impresses us so perhaps because it is the grandest visible characteristic of our universe. Furthermore, the original motion persists through the cosmogonic phase of motion and sees to the separating of atoms once joined. This is an infinite process, and Democritus argued that therefore no original cause should be sought; in Aristotle's words:

They are wrong and fail to state the causal necessity, who say that things have always happened so and think this explains their origin. So Democritus of Abdera says that there is no beginning [or origin, *arche*] of the infinite, that a cause is an origin and what is everlasting is infinite; therefore to ask ‘why?’ in a case like this is to look for an origin for the infinite.<sup>22</sup>

To conclude, the identification of necessity with the whirl is a mistake. The doxographical tradition made this mistake partly perhaps through an Empedoclean reading of Democritus,<sup>23</sup> and certainly because the whirl is

<sup>21</sup>Arist. *Gen. Corr.* 323b10 ff. (= 2.100.23 ff.).

<sup>22</sup>*Gen. An.* 742 b17. The translation is by Guthrie, *op. cit.* (above, n. 1) 397. This testimonium is not cited in Diels and Kranz, *op. cit.* (above, n. 4), as C. Moreschini, *Maia* 17 (1965) 391, noticed.

<sup>23</sup>Of the Empedoclean influence on the tradition, H. Schrekenberg, *Ananke: Unter-*

the most dramatic or spectacular side of atomism. There is also the fact that the whirl, or whirling, and necessity were already connected in poetry: Aeschylus spoke of the “stubborn whirls of necessity” (*ἀνάγκης στερραῖς δίναις*)<sup>24</sup> and “my heart whirling in circles that bring to fulfillment” (*τελεσφόροις δίναις κυκλούμενον* [Headlam for MS *κυκώμενον*] *κέαρ*).<sup>25</sup> But the tradition also preserves an alternative to the whirl, as I have shown. Aëtius, who, under the heading “Concerning the essence of necessity,” spoke of the mutual blows and motion of the atoms, was closer to the truth than those who identified necessity with the whirl.<sup>26</sup>

## 2. ARISTOTLE’S CRITIQUE OF ATOMIST NECESSITY

To return to Aristotle’s synopsis of the atomists’ physical system, why does Aristotle say *ἀπὸ ταυτομάτου*, “from chance or spontaneity” (above, 344)? In this matter Simplicius follows Aristotle, and it is for this reason that we have B 167, one of the two B fragments on the whirl. Simplicius says: “Democritus, where he says ‘a whirl consisting of all sorts of shapes was separated from the whole,’ seems to beget the whirl from chance and spontaneity: how and from what cause it comes he does not say.”<sup>27</sup> Contrary to these statements of chance as a cause, it is clear that the atomists’ system was deterministic, that necessity is essential to their hypothesis. Furthermore, there is in the ethical fragments of Democritus an emphatically disparaging view of chance, which must follow from the physical determinism. According to the atomist necessity, there will be no chance events, and Democritus belongs, as I shall show, with those mentioned by Aristotle in *Physics* 2.4 (195b31–196a11) who deny chance.

It should be pointed out first of all that the account of atomist causality in terms of spontaneity and chance which we find in the second chapter of *Physics* 2 and in Simplicius’ commentary on 196a24–28 is not found elsewhere in the tradition concerning the atomists. Guthrie is somewhat misleading when he says generally that “both necessity and chance are alleged as causes” of the movements of the atoms.<sup>28</sup> Schmid makes the same mistake when he says, “The power which without plan or purpose keeps the world in motion bears, besides the name *ἀνάγκη*, also the

*suchung zur Geschichte des Wortgebrauchs* (Munich 1964) 115, observes: “. . . Muss die Identifizierung (Dem. A 1; II 84, 19) oder Parallelstellung (Dem. A 83) von *ἀνάγκη* und *δίνη* als Kontamination gelten, denn der Stufenfolge Ananke—Philia und Neikos—Elemente bei Empedokles kann nur die Reihe Ananke—Dinos—Atome bei den Atomisten entsprechen.”

<sup>24</sup>*PV* 1052.

<sup>25</sup>*Ag.* 996.

<sup>26</sup>Aëtius: 2.101.2–3.

<sup>27</sup>Simpl. *in Phys.* 327.24–26 (= B167).

<sup>28</sup>Guthrie, *op. cit.* (above, n. 1) 414.

designation *αὐτόματον* or *τύχη*".<sup>29</sup> He cites for *αὐτόματον*, besides Simplicius and Aristotle and one passage in Epicurus obviously influenced by Aristotle, one highly ambiguous passage in Aëtius which I shall discuss; for *τύχη*, two passages both referring to Leucippus, one from Cicero (in which he uses the phrase *concurso quodam fortuito*) and one from Aëtius, where *κίνησις* is modified by *τυχαίαν*.<sup>30</sup> But both of these can be discounted in the light of the preponderant stress laid on necessity in the rest of the tradition.

In the passage of Aëtius cited by Schmid for *αὐτόματον*, spontaneity and necessity are coupled with reference to Democritus, but here Democritus, Anaxagoras, and the Stoics are lumped together and it is not clear which of five causes mentioned refers to which philosopher(s).<sup>31</sup> In other words, we are dealing with a single passage in Aristotle and Simplicius' dubious corroboration. As for the phrases from the poets quoted by Guthrie, who suggests that the identification of chance and necessity was natural and general in Greek thought,<sup>32</sup> these can be otherwise explained: a chance event may be said to have the force of necessity if its consequences are as inexorable as necessity.

The solution of the apparent contradiction between Aristotle's account of atomist causality and the account in terms of necessity has, for at least a century, taken this form: the atomists believed that chance was subjective and necessity was objective. Necessity was what was true about the world and everything happened according to necessity, but owing to the limitations of the human mind, which could not perceive the infinite series of causes lying behind events, it would seem that some events occurred by chance. The genealogy of this interpretation can be traced from Guthrie<sup>33</sup> back to Bailey,<sup>34</sup> to Goedeckemeyer,<sup>35</sup> to Windelband.<sup>36</sup> No doubt the atomists, if called upon to explain some chance event or other, would argue that the term "chance" had only subjective meaning; and thus chance would have been an item in their theory of knowledge. "Men have fashioned an image of Chance as an excuse for their own stupidity".<sup>37</sup> But subjective chance and objective necessity are not the solution of the apparent contradiction in Aristotle.

All the commentators have observed that Aristotle tends to discuss the

<sup>29</sup>W. Schmid and O. Stählin, *Geschichte der gr. Literatur*, Vol. 5, 2nd Half, 2nd Section (Munich 1948) 283.

<sup>30</sup>*Ibid.*, n. 17; 284, n. 1.

<sup>31</sup>Aëtius: 2.22.3 ff.

<sup>32</sup>Guthrie, *op. cit.* (above, n. 1) 415, n. 1.

<sup>33</sup>Guthrie, *op. cit.* (above, n. 1) 414-419.

<sup>34</sup>Bailey, *op. cit.* (above, n. 2) 143.

<sup>35</sup>A. Goedeckemeyer, *Epikurs Verhältnis zu Demokrit* (Strassburg 1897) 40.

<sup>36</sup>W. Windelband, *Die Lehren vom Zufall* (Berlin 1870) 20 ff.

<sup>37</sup>Democritus B 197 in the translation by Freeman, *op. cit.* (above, n. 11).

atomists in the language of teleology; and there is often the question whether Aristotle is reporting what some earlier thinker thought or what, according to Aristotle, he must have thought. The solution to the present difficulty lies in the fact that Aristotle has stated the atomist position in his own terms: ἀπὸ ταῦτομάτου means οὐχ ἕνεκά τινος. Consider Aristotle's definition of *to automaton*: "When, in events which are generally (*haplōs*) for some purpose, something the cause of which is external happens not for the sake of what results from it, then we say it happens ἀπὸ ταῦτομάτου".<sup>38</sup> Elsewhere, when Aristotle reports the doctrine of Democritus, he uses not "spontaneity" but the expected "necessity:" "Omitting to speak of the end (τὸ οὐδ' ἕνεκα) Democritus refers everything which nature uses to necessity."<sup>39</sup>

The difference between Aristotle and the atomists can be stated as follows: for Aristotle there is no deterministic necessity; there are ends; and chance, since there is chance, can be understood only with reference to some end; for Democritus, there is necessity; there are no ends and therefore no chance. Thus Aristotle argues, on the basis of his own views and his definitions, that the atomists attribute the generation of this world to chance. He so argues because, according to his definition of chance (i.e., *to automaton*), the cosmos of the atomists is the result of spontaneity in that it serves ends for which it was not designed.

In short, the contradiction between Aristotle's use of *to automaton* in *Physics* 2.4 and the "necessity" mentioned elsewhere in the tradition is simply a matter of his stating the atomists' views in his own terms and from his own point of view. This interpretation squares with the rest of *Physics* 2.4. In this chapter, Aristotle distinguishes three positions on chance and spontaneity as causes: there are those who deny such causes (195b36–196a24); those who ascribe the origin of this world and all worlds to spontaneity (196a24–b5); those who affirm chance as a cause which, as divine, is obscure to human reason (196b5–9). The atomists obviously belong to the second group, those to whom the whirl is attributed (cf. 196a24–28 quoted above). They also belong to the first group, those who deny chance. Aristotle is not inconsistent: on his definition of *to automaton*, it is possible to say that the atomists' world is caused by spontaneity but that in this world chance (*tyche*) is not a cause.<sup>40</sup>

Certain allusions in Aristotle's statement concerning the first group have sometimes seemed ambiguous. On the basis of the present discussion,

<sup>38</sup>*Phys.* 197b 18 ff.

<sup>39</sup>*Gen. An.* 789b 2 (=2.101.1–2).

<sup>40</sup>Aristotle distinguishes between *tyche* and *to automaton* in *Physics* 2.6. See Guthrie, *op. cit.* (above, n. 1), for a discussion of *Physics* 2.4. Guthrie believes that the atomists did attribute "the great cosmic events" to chance and thus he believes that the third group, too, includes the atomists.

the references of these allusions can be established. Aristotle says (195b36–196a16):

Some question the existence of chance and spontaneity. They say that nothing happens by chance, but there is a definite cause of everything which we say comes of chance or spontaneity. For example, the cause of one's going "by chance" to market and meeting someone whom one wanted to, but did not expect to, meet, is that one wanted to go to market. Similarly in the case of everything else said to be "by chance," it is always possible to find some cause which is not chance. And indeed if there were such a thing as chance, it would truly appear a strange thing, and one might wonder why none of the old philosophers defined it in discussing the causes of genesis and corruption but apparently they, too, thought that nothing was by chance. In any case, this is strange, too: many things both come to be and are by chance and spontaneity, and everyone (πάντες), while aware that it is possible to refer each of the things that comes to be to some cause (just as in the old argument that eliminates chance), says that some of these things are by chance and some not.

The allusions in question appear in italics. The atomists should be included in "the old philosophers" and "the old argument" is the atomists' (cf. the passage of Simplicius quoted in Section 3 below). What "everyone" (πάντες) thinks is the common-sense point of view, set against the atomists'.<sup>41</sup> Note that Simplicius (*Phys.* 328.5) paraphrases πάντες by οἱ πολλοί.

### 3. CHANCE. THE ETHICS. FREEDOM?

Democritus is then to be understood as a member of the first group, those who say that nothing results from chance but that there is a definite cause of everything. The example thrice used by Aristotle,<sup>42</sup> which he refers to as *ho palaios logos*,<sup>43</sup> is that of the man who goes to market and there meets someone whom he wanted to meet but did not expect to meet. We say that the meeting was by chance but Democritus would argue that there was a definite cause of the meeting, namely, the man's desire to go to market. Simplicius says that *ho palaios logos* seems to refer to Democritus and goes on to say, relying on Eudemus,

Even if Democritus seems to use chance in cosmogony [here Simplicius has misunderstood Aristotle's attribution of *to automaton* to the atomists] in his less systematic works (?έν τοῖς μερικωτέροις) he says chance is the cause of nothing, referring chance to other causes, e.g., he refers the cause of finding the treasure [not to chance but] to digging or the planting of the olive, and the cracking of the bald man's pate [not to chance but] to the eagle's dropping the tortoise in order to crack it open.<sup>44</sup>

<sup>41</sup>Bailey, *op. cit.* (above, n. 2), thought that πάντες included the atomists.

<sup>42</sup>*Phys.* 196a 3–5; 196b 33–37; 197a 15–17; Simpl. in *Phys.* 328.31–37.

<sup>43</sup>*Phys.* 196a 14.

<sup>44</sup>Simpl. in *Phys.* 330.14 ff. Aelian (*NA* 7.16) makes the bald man Aeschylus.

Similarly, Simplicius says elsewhere:

we see that some of the things that come from art also come from chance. For health seems to come from chance just as from art. For someone who is thirsty drinks cold water and becomes healthy. But probably Democritus says that not chance but thirst was the cause of health.<sup>45</sup>

But the word chance does occur several times in the ethical fragments and, although Democritus disparages chance, yet his use of the word seems a kind of admission of chance, contrary to the physical system, which denies chance altogether, and contrary to the reports of Simplicius, according to whom Democritus denied chance in human affairs as well. This inconsistency between the physics and the ethics has been explained on the grounds that Democritus' ethics "are largely independent of his physics".<sup>46</sup>

But in the ethical fragments Democritus may have used chance in a colloquial sense. Though he denied chance completely as a cause, for it could have no meaning in this sense, he did not necessarily assume a Heraclitean contempt for the facts of ordinary experience but could have allowed a valid colloquial sense to chance. Here is where the notion of subjective chance and objective necessity is in place, and preserves a consistent relation between the ethical fragments on chance and the physical fragments on necessity. Chance is simply a matter of subjective limitations. When we say, "This happened by chance" we mean, "The necessity behind this is obscure to us." Chance thus becomes an item in the atomists' theory of knowledge. Chance has the same status as colour, for instance.<sup>47</sup> If the distinction between the philosopher and the ordinary

<sup>45</sup>*In Phys.* 328.1–5.

<sup>46</sup>Bailey, *op. cit.* (above, n. 2) 188. The view that there is a gap between Democritus' physics and ethics goes back to antiquity. Dionysios, bishop of Alexandria (in Eusebius), after quoting Democritus' statement, "[I would] rather discover one cause than gain the kingdom of Persia" (B 118. The translation is by Freeman, *op. cit.* [above, n. 13]), goes on to complain, "and though he speaks thus, his account of causes is rash and does not give true causes, since he starts from a vain principle and shifting grounds, and does not see the root and common necessity of the nature of things but considers the greatest wisdom the understanding of events which occur unwisely or irrationally, and though he makes chance the queen and mistress of the universal and divine things, and explains that everything has occurred by chance, he banishes chance from human life and refutes as fools those who honor chance" (2.166.10–15). It was no doubt under Aristotle's influence that Dionysios labelled Democritus' cosmic principle chance, but, putting aside this error, one sees that he perceived an inconsistency between the physics and the ethics. For the fools, cf. B 119.

<sup>47</sup>G. Vlastos, "Ethics and Physics in Democritus, II," *The Philosophical Review* 55 (1946) 56. Vlastos sees the material soul as the grounds of the unity of Democritus' ethics and physics. C. C. W. Taylor, "Pleasure, Knowledge and Sensation in Democritus," *Phronesis* 12 (1967) 6–27, while not denying the hypothetical soundness of

man may be invoked to explain Democritus' theory of knowledge, we may say that the ordinary man's belief in chance follows from his blindness to the atomic necessity in the same way that his belief in the validity of his sensations of colour follows from ignorance of the atomic shapes and configurations.

But for Aristotle, to return to his critique of the atomists, chance is admissible as a cause. In *Physics* 2.5 Aristotle seeks to show what is reasonable in each of the contradictory opinions about chance reported in chapter 4. He can account for both of the (apparently) contradictory opinions that (a) chance is real or (b) is (simply) a name for that which is obscure to the human mind, on the basis of a distinction between *per se* and incidental causes,<sup>48</sup> a distinction developed in the first part of chapter 5. Chance is defined as an incidental cause in chosen actions directed toward some end. Now if in this sphere chance is incidentally a cause (though it is absolutely the cause of nothing), one can agree that there is no such thing as chance, for the reason that the number of incidental causes is infinite. To return to the man in the market, we can say that he came to market to see some one, or to be a prosecutor or defendant in a case at law, or to see a spectacle. In other words, the vast number of incidental causes gives promise that we may hit upon the definite cause and that thus what seemed to happen by chance really had a definite cause. On the other hand, if there is an infinite number of incidental causes, it is also reasonable to say that chance is obscure to the human mind.

But Democritus' disparagement of chance in the ethical fragments is not simply logical in origin, resting on the conclusion drawn from necessity that there is no chance. It would be odd if the physical thesis concerning necessity were true but at the same time men's ethical purposes were seriously interfered with by chance. Therefore Democritus attempted to show that the original necessity itself had in the ethical and social sphere provided man with a defense against *tyche*. That defense is of course the use of his mind, for, as we have seen, man, or at least the wise man, can see through chance to necessity, and if he can do so, presumably he can control his affairs or himself to an extent compatible with the control of necessity.

The connection here between the physical and ethical theory is to be

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Vlastos' argument, doubts whether there is sufficient evidence for it in the fragments and seeks the unity in the common requirement of an empirical approach to things.

Empiricism is stressed again by G. Strohmaier, "Demokrit über die Sonnenstäubchen: Ein neues Fragment in arabischer Überlieferung," *Philologos* 112 (1968) 1-19.

<sup>48</sup>Cf. A. Torstrik, "ΠΕΡΙ ΤΥΧΗΣ ΚΑΙ ΤΟΥ ΑΤΤΟΜΑΤΟΥ: Aristot. *Phys.* B 4-6," *Hermes* 9 (1875) 452-453.

sought in the Democritean anthropology.<sup>49</sup> Democritus made the origin of man an episode in cosmogony, and man's rational and technical capacities develop along the same lines as the rest of the cosmos, through necessity in Tzetzes' account,<sup>50</sup> or, in Diodorus', through trial,<sup>51</sup> use,<sup>52</sup> and advantage.<sup>53</sup> Diodorus says: "For in general use itself taught man everything, leading the way to knowledge of each thing in a manner befitting a stout creature who possessed hands to help him with everything and reason and presence of mind".<sup>54</sup> The detail concerning hands brings out the determinism of the theory, as can be seen in a remark of Aristotle's concerning the same detail in Anaxagoras: "Anaxagoras says that through the possession of hands man is the most intelligent of living things but it is reasonable to say that through being the most intelligent he acquires hands. For hands are an organ, and nature, like an intelligent man, distributes each organ to the thing which can use it."<sup>55</sup>

The principle of use which guided man the child of necessity could guide him still, for the good is primary and it is man's ignorance which turns the good into bad (B 173). As Vlastos has pointed out,<sup>56</sup> necessity in Democritus is not the opposite of art, as in Aeschylus,<sup>57</sup> but its mother: "(*Music is the youngest of the arts*). For it was not necessity that separated it off (i.e., *created it*), but it arose from the existing superfluity."<sup>58</sup> The oldest arts were then created by necessity, as man himself, with his intelligence, was. Thus it is given in the original necessity that man by means of these arts and this intelligence can combat *tyche*; and thus in the ethical sphere the logical consequences of the physical theory of necessity, according to which there can be no chance, are borne out. The optimistic side of atomism is implied in the fragment of Leucippus on necessity: "Nothing happens at random; everything happens out of reason and by necessity".<sup>59</sup> "Out of reason" is inaccurate; it would be better to say with Guthrie, "for a reason",<sup>60</sup> since reason is not a characteristic of the quality-less atoms and is not a cause in the atomic hypothesis. But what is

<sup>49</sup>See T. Cole, *Democritus and the Sources of Greek Anthropology* (APA Monograph 25 [Cleveland 1967]), on this subject.

<sup>50</sup>2.138.1. Cf. Cole, *op. cit.* (above, n. 49) 29–32.

<sup>51</sup>2.136.9.

<sup>52</sup>2.136.13.

<sup>53</sup>2.135.36.

<sup>54</sup>2.136.12–15. Cf. Cole, *op. cit.* (above, n. 49) 40–41.

<sup>55</sup>*Part. An.* 687a 7 ff. (= 2.30.5 ff.).

<sup>56</sup>Vlastos, *op. cit.* (above, n. 40) 55.

<sup>57</sup>*PV* 514.

<sup>58</sup>B 144. The translation is by Freeman, *op. cit.* (above, n. 13).

<sup>59</sup>B 2. The translation is by Freeman.

<sup>60</sup>Guthrie, *op. cit.* (above, n. 1) 415.

optimistic in this fragment is the apparent assertion that necessity is amenable to reason: its works are in accordance with the distinguishing characteristic of man, his reason.<sup>61</sup>

Therefore chance appears in the ethical fragments in opposition to intelligence: "Fools are shaped by the gifts of Chance, but those who understand these things by the gifts of wisdom".<sup>62</sup> Chance appears here as a teacher, affecting the mind. In other fragments as well, Democritus regarded chance psychologically rather than as an objective force. "Chance is generous but unreliable. Nature, however, is self-sufficient. Therefore it is victorious, by means of its smaller but reliable (*power*) over the greater promise of hope".<sup>63</sup> Here Democritus has paraphrased *chance* (*tyche*) with *hope*, i.e., with a psychological trait. Again, Democritus contrasts chance with a trait of character: "Chance provides a rich table, but moderation a self-sufficient one".<sup>64</sup> Since chance is a dimension of character, the immoderate hope for more than is sufficient, it can be contrasted with moderation. Even when Democritus speaks of chance as something that comes to man from outside him, he treats it in terms of the effect on his inner disposition:

The man who wishes to have serenity of spirit should not engage in many activities, either private or public, nor choose activities beyond his power and natural capacity. He must guard against this, so that when good fortune strikes him and leads him on to excess by means of (*false*) seeming ( $\tau\hat{\omega}\delta\kappa\epsilon\acute{\iota}\nu$ ), he must rate it low, and not attempt things beyond his powers. A reasonable fulness is better than over fulness.<sup>65</sup>

In sum, the position of Democritus is decidedly against *tyche*, and *tyche* is regarded as a subjective phenomenon. "Men have fashioned an image of Chance as an excuse for their own stupidity. For Chance rarely conflicts with Intelligence, and most things in life can be set in order by an intelligent sharp-sightedness".<sup>66</sup> There remains only one noteworthy fragment which mentions chance: "Daring is the beginning of action, but chance is responsible for the end".<sup>67</sup> Since this fragment contradicts everything else Democritus says about chance, and since the form of Stobaeus' quotation obscures the reference of these words, we are entitled to ask here whether we should think of this as Democritus' view of chance in general or whether he was not referring to persons who, contrary to the advice of other of his *sententiae* on chance, relied too little

<sup>61</sup>Cf. Catrares: 2.137.22–23.

<sup>62</sup>B 197. This translation and all the rest are by Freeman.

<sup>63</sup>B 176.

<sup>64</sup>B 210.

<sup>65</sup>B 3.

<sup>66</sup>B 119.

<sup>67</sup>B 269.

on moderation and committed themselves to overreaching and tychistic projects.

The note of moral exhortation suggests that man has a free choice between alternative ways of life, and thus that he is not in the grip of the original necessity which created the cosmos and him and endowed him with the arts. From the ethical point of view man seems to emerge as an island of freedom,<sup>68</sup> a floating island, perhaps, in a sea of necessity. If so, then Democritus' system is either dualistic or self-contradictory. But the example of chance in the ethical thought of Democritus has shown how freedom, if it has any place at all in Democritus, should be understood. Man is free to trust to luck through wilful disregard for or ignorance of the laws of nature, given by necessity. But he is powerless to change the facts of necessity, and from this point of view his freedom is an illusion, like the appearance of colour. His freedom is merely subjective and of infinite unconcern to the rest of the universe. The atomic theory, which accounted so well for the various appearances of the same phenomena to various people—tragedies and comedies are composed of the same alphabet<sup>69</sup>—also accounted for a specious freedom.

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<sup>68</sup>Schmid/Stählin, *op. cit.* (above, n. 23) 281.

<sup>69</sup>Arist. *Gen. Corr.* 314a 21 ff. (=2.74.13 ff.).