

Chapter 13

Leukippos and Demokritos

1. Leukippos and the “Great Diakosmos”

Away in the North-East, while Anaxagoras was setting Athens by the ears, and Philolaos was letting the world know what the Pythagoreans believed, lived a notable thinker named Leukippos. Quite possibly he was born in the small Thracian city of Abdera (where he certainly lived and worked with Demokritos in his maturity). But he may have come from Elea (as Theophrastos thought) or even from Miletos (where it all began). The man is a mystery.

Theophrastos says that he was “associated with Parmenides” (67 A 8).ⁱ This would have been possible (on our dating) if Parmenides lived beyond his seventieth year, and Leukippos was born in about 480 BCE in Elea. But seems just as likely that he studied Parmenides, Zeno and Melissos only *in their books*. The Eleatics certainly influenced him; and he may have spent some time in Elea, but if he had to travel to get there, he is unlikely to have done so while Parmenides was still alive.

His writings were probably not voluminous; and they were rapidly lost to sight in the great mass of essays produced by his younger friend Demokritos. This probably accounts for the claim attributed to Epikouros (and his successor Hermarchos) that there never was a philosopher called Leukippos (A 2).ⁱⁱ But Theophrastos (and his students) knew that the book called the *Great*

Diakosmos was written by Leukippos (A 33). (He may have written another book *On Mind* [*Nous*] also.)ⁱⁱⁱ

It is clear that Aristotle regarded Leukippos as the originator of the Atomic theory. Aristotle wrote an essay on Demokritos; and we can safely assume therefore that what he says specifically about Leukippos is based upon explicit attributions by Demokritos, or on the book or books that Aristotle knew to be the work of the older man. We shall follow his lead here.

The great revolutionary novelty in Leukippos' thought was the proclamation of the Void as one form of Eleatic Being: "Nothing *is*, just as much as Thing," he said (68 B 156).^{iv} This was a conscious and deliberate modification of the Parmenidean insistence that "Not-Being is Not"; and that it could not even be "said or known." Parmenides knew, of course, that in a certain sense it could be *said* — for he said it. But he argued that it could not be said *properly*. What looks like the saying of it, has no *meaning*. Leukippos insists that this is a "mistake." "Nothing" is the one and only name that can be characterized in a purely negative way, so that we can recognize and identify what is *meant*.

Many scholars seem to think that there was (or at least ought to have been) an *argument* in defence of the "Being is *no more than* Not Being" claim.^v I doubt if the Atomists thought so, but it is easy to see what the reasoning in their minds was. We must start with the simply evident *fact that there is motion*. Zeno cannot be allowed to upset that certainty; and the existence of void has to be granted in order for motion to be possible.

Leukippos had (no doubt) read the work of Philolaos, and he knew that the cosmology of the Pythagoreans depended on the admission of the Void. But he found their "creative numbers" which express themselves in empty space quite unintelligible; and he accepted from the hypotheses of Zeno the mathematical intuition of invisibly small quantities in place of the Pythagorean numbers.^{vi} It is probable that he consciously accepted the challenge of Melissos that the Many must be conceived on the model of the homogeneous One (30 B 8).^{vii} But the crucial assumptions of his theory were that

the Empty is just as real as the Full; and that the Full is invisibly small but *not* further divisible. He owed to Melissos his conception of the absolute continuity and homogeneity of the *Full*; for the rest his theory was a resolution of the conflict between Zeno and the Pythagoreans about mathematical intuition. He distinguished between what *truly is*, and what *appears*, as rigorously as any of the Eleatics. In this respect he was different from Empedokles and Anaxagoras.

The many positive “things” in the Atomic theory are an infinite number of invisibly small and absolutely hard (“uncuttable”) particles. They are self-moving, and they fly spontaneously in all directions. They vary in their “rhythm” (i.e. their moving *shape*, as a spinning A would from a flying N); in their “touching approach” (as AN does from NA); and in their “turning” (as Z does from N) (68 A 37).^{viii} This terminology is carefully designed to emphasize that the atoms are never still. They do not have “position” or “contact,” but “turn” and “coming into contact”; and this makes even their shape into a “rhythm.” We know by mathematical intuition that the possible varieties of shape are infinite, and the variations of speed are infinite also; thus the possible “rhythms” are a squared infinity. The possibilities of coming into contact, and of different “turning” before, when, and after this happens are obviously infinite also (67 A 9, A 8).^{ix} But nothing about an individual atom can ever be affected except the direction of its perpetual motion; the atoms are absolute *individuals*; and since they have been moving forever, it is *always* the case that the motion of any atom has actually been determined *necessarily* by a previous collision (67 A 16; 68 A 47).^x Spontaneity and strict determinism coincide.

The visible Cosmos arises because atoms whose “rhythms” (moving shapes) are complementary — atoms that *fit together* — become entangled when they come into contact. From that moment they must travel together; and wherever a circular motion (or “eddy”) is established, it will pick up more and more atoms. In the infinity of empty space many of these systems will arise (67 A 27, A 40).^{xi}

The formation of a stable *kosmos* happens only when a great “whirl” or “eddy” of atoms gets “separated off” from the infinite void of space through the formation of a surrounding “cloak” or

membrane of tightly interwoven atoms. In order for this to happen, cloak-atoms must have a strong tendency to combine with the complements into which they fit. Otherwise the complete randomness of their motion would separate them almost as fast as they came together; so it is a mistake to think of the atoms as simply *mechanical* in their motions. The Atomists were anxious to insist that there is no *intelligent design* (or conscious control) in the cosmic order as such. But the atoms behave *instinctively* rather than mechanically. They are on the boundary-line, so to speak, between the organic and the inorganic worlds; and the *kosmos* is like an unconscious, but living and mortal, organism (67 A 1, 30; A 10, A 24). Once the “Cloak” is formed the complex of atoms trapped inside it will be “winnowed”; smaller, rounder and lighter atoms will fly out to the periphery; and larger atoms will congregate in the center (67 A 1, 31).

It seems clear that, in order to account for the formation of solid bodies, Leukippos posited a kind of “like to like” attraction of some types of atoms.^{xii} He could hardly have avoided forming special hypotheses about living bodies, because the simple mechanical description of the atoms assigns to the light fiery ones, a natural tendency to move to the outer Heaven; but the atoms of “soul” resemble fire-atoms, and they have somehow been trapped down here at the center. It is quite credible that Leukippos should have written a treatise “On *Nous*,” because reading Anaxagoras would have focussed his mind upon organic life as a peculiar problem for his own view. All of the atoms are “alive” (self-moving) as he conceives them; but some of them do not do what mathematical-mechanical reasoning would lead us to expect.^{xiii} The behavior of soul-atoms is the most important phenomenon of this paradoxical kind. They produce “consciousness”; and Leukippos may have reasoned by analogy from the human organism, that the circular motion of the fiery atoms at the periphery of the *kosmos* also generates some kind of divine consciousness (68 A 74).^{xiv}

The one sentence of Leukippos’ essay “On Mind” that survives does not help us towards understanding the special problem of the atomic theory of finite organisms. It simply asserts that “Nothing comes to be at random but all things for a reason and of necessity” (67 B 2).^{xv} This is a methodological principle for inquiry. The motion of the atoms in our world is determined by their

place in it; so everything that happens at the level of sense-perception has a necessary cause. “Truth lies in the appearing and the appearances are conflicting and infinitely many” (67 A 9; 68 B 125).^{xvi}

But we must not be misled by this Protagorean relativity of the sensible world into the pessimistic belief that science is impossible. Just how we have come to be here seeking to understand why our sense-impressions are the way they are, is a matter for further inquiry.

Some reports about the detailed views of Leukippos on cosmology and physiology have come down to us. But they are very fragmentary (and sometimes hard to interpret). I shall deal with them in their place in the account of Demokritos. In general it is not possible to distinguish between what Leukippos said, and what Demokritos added or amended in the system of Atomism.

2. Life and Works of Demokritos

Demokritos was younger than Leukippos. He was born in Abdera, but became a great traveller in his maturity. In the *Little Diakosmos* he said that he was forty years younger than Anaxagoras (68 A 1, 41). This would mean that he was born about 460 BCE, some nine years after Sokrates. He may have lived a very long life; some reports claim that he was over a hundred years old when he died (68 A 1, 39, 43; A 4, A 5, A6).^{xvii} The reports give him several teachers; but Leukippos was the one who mattered, and the only one that we can be sure of. He may have studied with Anaxagoras; and with Philolaos.^{xviii}

Apart from travelling far and wide^{xix} — to Egypt and to the East, as well as all over the Greek world — Demokritos wrote a long list of books and essays. The catalogue made by Thrasyllus in the Alexandrian Library lists more than sixty works arranged in “tetralogies” like the *Dialogues* of Plato. Unlike Plato’s *Dialogues*, alas, they have all perished. Cicero praised Demokritos’ style; and we have not quite three hundred scraps from all of the treatises on Natural Philosophy, cosmology, astronomy, geography, physiology, medicine, agriculture, theory of

knowledge, mathematics, music, cultural anthropology, and ethics. In what remains to us the ethical fragments bulk the largest.

The *Little Diakosmos* was probably a treatise on human nature (humanity being the microcosm, as distinct from the macrocosm dealt with in the *Great Diakosmos* of Leukippos).^{xx} The discussion of human affairs has to be (in the main) at the level of “appearance.” So the atomic theory is largely irrelevant to many of Demokritos’ humane concerns; but we shall often be able to see, in a general way, how his positions and attitudes are conditioned and affected by his atomism. He was a serenely happy and peaceable man himself — he became known in the later tradition as “the laughing philosopher” in antithesis to Herakleitos. So it is not surprising that he shows a considerable degree of interest in the problem of how we can live contented lives. He certainly did not despise politics and social existence; but like Anaxagoras he lived for research.^{xxi} It is a pity that (because of the stories of his travels) the forgers made this paragon of scientific common sense into a master magician and an alchemist.

3. The Atomic Kosmos

The formation of a “whirl” can be intuitively projected if we begin by imagining the combined motion of two atoms that become “fitted together” through a collision when they are initially moving in different directions. Whatever their shared direction may be as a result, they will now be *spinning*; and whatever else becomes entangled with them will spin with them. Whenever the complex spinning becomes circular, a *kosmos* is beginning to form. The Atomists were quite clear that every such formation would be different (67 A 1, 31; 68 A 40).^{xxii} They thought that mechanical *sifting* would produce a “like to like” result; but we cannot understand how a “cloak” membrane that will hold the finest atoms inside it could form round any such great whirl unless we suppose that the hooked particles of which it consists are strongly attracted to one another when they meet. The cloak-atoms are not the finest atoms, and they do not fit together perfectly. So some of the fiery atoms that fly to the periphery inside will escape into the Void through the small holes in

the cloak. (These are replaced by similar atoms that fly in from the Void, so an approximate balance is maintained — and we shall learn shortly how important this is. But in any case, not all of the fiery atoms escape. They also must be strongly attracted to one another, because large masses of them clump together on the cloak, to form the fixed stars.^{xxiii} At the center of the great whirl, on the other hand, the mingled earth and water particles must be more weakly attracted. In part, they separate by themselves into land and sea; and much of the earthy substance that congeals and dries out can be cut — or separated by force — fairly easily. (Both fire and water are easily cloven; but then the divided parts flow back together again spontaneously.)

Attraction is a motive force that Aristotle would have accepted as “natural.” It is clear, however, that the Atomists did not speak of it very explicitly at the atomic level. The normal relation of atoms coming together was one that Aristotle calls “strife” (i.e., they bounce off of one another); but Demokritos recognizes and appeals to attraction at the level of animal life (68 B 164), wherever animal behavior cannot be *mechanically* accounted for.^{xxiv} With solid bodies like pebbles, the mechanical sifting action of the vortex becomes plausible. But the “cloak” atoms fit so closely and so strongly that except for the very finest ones no other atoms can pass through; and the Atomists were certainly aware that they did not have to suppose that atomic motion was completely random. Whatever was “infinite” in our experience (in the sense that it *always* happens) could be admitted at the atomic level. Thus, it appears that they admitted the *weight* of the larger atoms (not as motion in a particular direction but as relative *bulk*); and this translates into the attraction of larger atoms toward one another at the center of the whirl.^{xxv} For unlike Epikouros, Leukippos and Demokritos did not admit any absolute up and down.

Contained as it is within a “cloak” of atoms, the *kosmos* is cut off from the infinite” (as Leukippos said — 67 A 1, 31). The Earth formed gradually at the center, like an organism maturing. Eventually it will grow old and die. This indicates that the atoms are primitively endowed with the capacity to generate life. The human being, in particular, is a *mikrokosmos* (68 B 34).^{xxvi} There has to be a skin of hooked atoms around any finite organism just as there is around the *kosmos*. The fiery atoms whirl fast; and solid bodies in the outer part of the great whirl are on fire. How these

solid bodies (which were originally wet) got out there we do not know (and probably Leukippos made no pretence of knowing). Demokritos seems to have thought that the Sun and Moon were formed in the center of the eddy, and that the Sun (in particular) got stoked up with extra fire atoms as it was carried towards the periphery (68 A 39).^{xxvii}

The *kosmos* loses energy as the fine atoms escape; but also it gains energy because others can come in from the Void outside. The *kosmos* will begin to die, and break up, when it cannot *feed* like this; it certainly enjoys something rather like a life of its own. (The theory of fire as energy probably reflects Pythagorean influence on Leukippos.)^{xxviii}

The influence of Anaxagoras can be seen in the theory of air, water and earth. These are “seed-collections” (because they can be transformed from one to another), whereas fire and “soul” were simpler (round, fine) atoms that moved rapidly, but could also cling together closely (68 A 60a, A 101 — both from Aristotle).^{xxix}

Demokritos understood the order of the planets as worked out in the astronomy of Philolaos; Leukippos thought the Sun must be furthest toward the periphery of the spherical cosmos, while the planets and Moon were between the Sun and us (67 A 1, 33; 68 A 40, A 86).^{xxx} Clearly he took this view because of the Sun’s heat and its speed of revolution. Demokritos accepted the view of both Philolaos and Anaxagoras that the Moon is like the Earth; and he agreed with them that it shines by reflected light (68 A 90, A 89a).^{xxxi} He also took over Anaxagoras’ view of the Milky Way, and of comets. With respect to the Earth he seems to have followed Archelaos (the Earth is concave). But Leukippos also held that the Earth rotates. Almost certainly, this was because of his view of how an “eddy” works, and not the result of any Pythagorean influence. Demokritos’ view of the Earth’s dimensions (oblong, 1½ times as long as it is broad) is without precedent. The Earth has tilted because its South side grew heavier and more fertile.^{xxxii} There is a general tendency in Demokritos to fit older Ionian beliefs into the atomic framework; but also he wanted to avoid any contamination by popular religious beliefs. Thunder and lightning are cloud-collisions and close-fitting fiery

atoms, not actions of Zeus; and magnetism is atomic attraction through void “pores” (68 B 152; A 93, A 165).

The antipathy of the Atomists towards any theological (or consciously self-directed) conception of cosmic *Nous* is evident in their attitude towards time. They seem to have accepted time as a continuum, without troubling about Zeno’s arguments against motion. But time has no rationally cyclic or repetitive pattern. World-orders form and break down in it, just as casually as finite living things. Some of them last a long time, others perish early. Some perish in collisions. Time is just the order of appearance — or, in absolute terms, its lack of order. In its proper reference to *our* lives, time is simply the repetitive succession of day and night (68 A 72).

4. Finite life and mind

Inasmuch as all atoms move spontaneously, one might say that they are all alive. But the Atomists distinguished between organic and inorganic things by postulating that perceptible organisms depend upon certain fine and fire-like atoms which would not easily get mixed with other atomic forms. Leukippos and Demokritos supposed that fire itself was constituted by round and homogeneous atoms,^{xxxiii} which spontaneously fly away to the periphery of the cosmic sphere, and can even escape through the Cloak into the Void. The *kosmos* will “die” (and probably break down physically) when it can no longer replace its fire-losses with atoms flowing in from outside; and finite organic life is like this too. Thus we have to suppose that “life-atoms” are somewhat like ordinary fire-atoms, but rather less mechanical. Fire itself is not as mechanical as the atomic mixtures called Earth and Water. We can see this in the phenomenon of lightning, where the fire comes downwards to the Earth; and of course, the Earth itself is actually an organic mixture that produces the whole vegetable kingdom. (We must distinguish clearly between “the Earth” and “earth” as an element.)

The Atomists, like Archelaos, are rigorously monistic followers of Anaxagoras. They reject the separateness and purity of *Nous*. *Nous* is simply a rather special kind of mixture — one that has life-atoms in it; and life-atoms do not go in a definite direction, like fire-atoms. They dance up and down, and go every which way, like the motes in a sunbeam.^{xxxiv} But when they come together, their mutual attraction produces all kinds of orderly behavior in the mixtures in which this confluence happens. Inevitably the finite living mixture eventually loses more life-atoms than it gains, so that in the end the organism dies. But while there are enough life-atoms the mixture maintains itself and acts in a great range of “necessarily” orderly ways. Lucretius tells us that soul-atoms must *alternate* with body atoms. The soul atom makes its neighbors move. Thus the body is like the statue that Daedalos made to move by pouring quicksilver into it (68 A 108).^{xxxv}

There are two kinds of soul-atoms (at least): those that are spread through the whole body, which make us capable of movement and sensation; and those that congregate more particularly in the head, instead of going hand in hand with body-atoms. Organic life is maintained by breathing, which replenishes the supply of soul-atoms. Death occurs when the pressure of the outside world causes the body to lose its *congregated* soul-atoms. The final death of an organism is the climax of a gradual and indefinite process because many of the scattered soul-atoms remain in the body, and some living functions (such as growth of hair and nails) continue. But the breakup of the head-congregation is the end of all personal existence (68 A 105, A 117, A 160).

All sense-experience is phenomenal, not truly real. Sensation results from the impact of the atoms outside. We have a lengthy account (from Theophrastos) of how Democritos developed the briefer outline provided by Leukippos (68 A 135, B 9, B 11, B 125). The relativity of sense impressions (difference of taste, for example) results from the necessary *interaction* of atoms inside and outside of the organism. Yet Demokritos thought he could say that sweet tastes are caused by round atoms. (Theophrastos finds this inconsistent, but if we take Demokritos to mean “round atoms attracted to each other on both sides of the interaction” there is no necessary inconsistency.) The sense-organs are full of “pores” which receive the outside stimulus; thus if the pores vary then a *normal* sensation may vary (68 A 47, A 77, C 1).^{xxxvi}

This theory of “pores” came from Empedokles; and Leukippos also took over the Empedoklean theory of “effluences” to account for vision (67 A 29). The Atomists can say, more precisely than Empedokles, that things give off atomic images of themselves. That is why there are reflections in pools and mirrors — and on the retina. The image on the retina is tiny compared with that in the pool, so Demokritos produced the ingenious theory that the eye itself sends out an *active* atomic image which compresses things to its own scale (68 A 135).^{xxxvii} The airy atoms intervening between the eye and the object seen have an effect upon the interaction — which would be perfect in the Void (68 A 122).^{xxxviii} Demokritos was much interested in the mixing of colors, and offered atomic hypotheses about the colors that he took to be primary.

For hearing, he thought that the ear funnels sound to its own special pores (the air is shattered into its component atoms, and the sound atoms collect and pass on). He also had a theory about why we hear thunder only *after* we have seen the lightning (68 A 128, A 126a).^{xxxix} He suggested atomic shapes for several flavors on the tongue (68 A 129); and he failed to give what Theophrastos was willing to accept as a sufficient account of smell (68 A 135, 82). He also thought that some humans and animals have extra senses (68 A 115, A 116).

The “atomic” account of sensation is not very adequate; but the theory of the process of thought reaches the pitch of outright absurdity. Demokritos had to conceive thinking as the manipulation of very small images (like those that appear also in dreams). As Cicero commented ironically: “If I begin to think of the island of Britain, the *eidolon* of it will fly to my breast.”^{xl} (No theory of *memory* is to be found in our remains.)

Demokritos wrote an essay *On Logic or the Canon [of Truth]*; and he needed to, because his view was complex (68 B 108).^{xli} Thinking, like sensation, is a bodily alteration. There is thought that is directly provoked by sensation, and thought that is a simple activity of the living thinker; but the latter is disturbed by changes in the bodily environment (such as becoming hot or cold). True thought is dependent on healthy sensation. “Truth is what appears” — but it has to be thought about.

Demokritos accepts the Parmenidean distinction between Truth and the Way of Seeming, but believes that thought can move from Seeming to What Is (68 B 125, A 30; A 135, 58).^{xlii} This was a bold assumption when we consider what Protagoras and Gorgias had already made out of Parmenides' doctrine. But the Atomist's belief in science went hand in hand with a sceptical awareness of how limited our scientific knowledge is bound to remain. Aristotle says several times that the true is the phenomenon for Demokritos.^{xliii} But Demokritos himself says that phenomenal (sensory) cognition is only "bastard" knowledge (68 B 11).^{xliv} True knowledge, however, depends on this bastard brother; and Demokritos promised to set up the power of conviction for the senses (68 B 9).^{xlv} He praised Anaxagoras for saying that "phenomena are the sight of the unseen"; but he also insisted that "truth is in the depths" (59 B 21a).^{xlvi}

Demokritos seems to have grasped that deductive demonstration of empirical truths is not possible. But rational deduction and mathematical intuition are the key to our knowledge of the atoms; so it is not surprising that he did some quite distinguished work in mathematics (68 A 33; B 155).^{xlvii}

We can only reach the truth if we remember that *all* appearances are equally appearances of it. The "truth" of Protagoras is not *final*; but we must accept it as our starting point, and understand the "sick" (or idiosyncratic) impressions together with the healthy and normal ones. This is what lies behind the scepticism that Aristotle reports, and the rejection of the "healthy" standard of sensible truth that offended Theophrastos (68 A 112, A 135, 69). The Atomists were struggling to formulate the conception of "sensible confirmation of scientific hypothesis." But they had, as yet, no idea what to say or do about rival hypotheses that accounted for the sensible phenomena equally well. (It is absurd to ask them for an explanation of how our soul-atoms "know" themselves, or other atoms; if they offered us some theory about that — and it seems clear that they did not — we should only find it laughable. They were wise to accept the fact and say nothing; we are ourselves no better off.)

Demokritos was the greatest observer of “natural history” before Aristotle; and he did a lot of dissections and anatomical investigations. He was especially interested in embryology. He thought that “seed” — contributed by both parents — contained atoms from every part of the organism. Thus the soul-atoms from every part of the body could take control of their bodily companions, and by attracting their own likes, they could produce growth (68 A 153-6, 140-3). For the order of development — after the umbilical cord — Demokritos trusted the analogy of the great *kosmos*, and argued that the external parts must come first — meaning apparently the head and abdomen (68 A 144-5). Like Empedokles and Anaxagoras before him, he thought that plants were simply rooted animals. They can feel, and even think.^{xlviii}

5. Human life and culture

Human life (like animal life generally, one supposes) originated in the primeval mud (68 A 139).^{xlix} The first humans lived like animals and were not even socially inclined — only the need to survive drove them into groups.

There is an account of the origin and evolution of human culture in the historian Diodoros of Sicily () which was ascribed to Demokritos by Karl Reinhardt in 1912. After a period of enthusiastic endorsement, scholarly opinion became rather hesitant about the attribution. But Thomas Cole has shown that it ought to be accepted — partly because the fifth book of Lucretius evidently comes from the same source, and partly because there is no plausible alternative to Demokritos as the author.¹ Diodoros writes as follows:

They say that the first men lived an anarchic sort of life, going out to forage individually and living off the most palatable herbs and the fruit which grew wild on the trees. Then, since they were attacked by wild animals, they helped one another (instructed by their own self-interest); and thus gathering together because of fear, they slowly came to recognize one another’s shapes.

The sounds they made had no sense and were confused; but gradually they articulated their expressions, and by establishing

symbols among themselves for every sort of object they made the interpretation in each case intelligible to one another. Such groups came into existence throughout the inhabited world, and not all men had the same language, since each group organized its expressions as chance had it. Hence there are languages of every type, and the groups who first came into existence were the founders of all the different races.

Now the earliest men lived laboriously, none of the utilities of life having been discovered: they wore no clothes, they knew nothing of dwelling-places or of fire, they had not the slightest conception of cultivated produce. And not knowing how to harvest wild produce, they did not lay aside any fruits against need. Hence many of them died in winter from cold and from lack of food. Later, gradually instructed by experience, they took refuge in caves during the winter, and stored those fruits that could be preserved. Once fire and other utilities were recognized, the crafts and whatever else can benefit communal life were slowly discovered. For in general it was need itself which instructed men in everything, appropriately introducing knowledge of each thing to a creature which was well-equipped and which had assistants for every purpose in its hands, its reason, and its keenness of mind (68 B 5).^{li}

We can confirm that Demokritos held these views from other sources that name him. Thus, Philodemos tells us that he said the arts necessary for life developed first, and pleasurable arts such as music only arose later (68 B 144). Human language is local and various because it originated in accidental conventions; and many human skills arose through imitation of the animals (68 B 26, B 142, B 154).

Demokritos wrote quite a lot about music (though we have very little); and he believed in poetic inspiration as a kind of “divine madness” — the word “divine” itself being only a mad poetic metaphor here (68 B 17-18, B 21). Religion itself originated in the primitive fear of the unknown,

and of natural dangers; but the form that it has taken was much influenced by dreams. (The images in dreams have to come from the air, so the belief that the air atoms distort visual perception has its origin here.) Demokritos himself “prays” for good images, but we shall see in the discussion of his ethics (below) how he hoped to make sure of them. (“Prayer” here is only a recognition of the element of luck.)^{lii} The gods as images in dreams could at times be a form of inspiration, or divine madness (68 B 166, A 77).^{liii}

The Atomic theory provides an ontological base for the distinction between nature and convention which the Sophists were now forcing everyone to think about. It is not surprising that something analogous to his distinction between “legitimate” and “bastard” knowledge is visible in the *social* theory of Demokritos. The law, so far as it is rational and equal for all, is legitimate. Humans should be restrained from injuring one another. This is what is “natural” — if we assume that a tendency to guard and guide other complexes of atoms is itself natural to the soul atoms (68 B 47, B 174, B 245, B 248). But this assumption also implies that persuasion is more “natural” than compulsion, because every atomic organism is autonomous; so education is the great instrument of social reason. The law must aim to produce unanimity of belief and outlook. Envy and the other causes of civil strife must be eliminated as far as possible. The common good must be made visible, and recognized as universally desirable (68 A 166; B 181, B 191, B 249, B 252, B 287).

The rational fairness of law requires a rationally autonomous magistrate. This is the individual self who is controlled and guided by self-respect and inner conscience. But crime must in any case be punished, and those who cannot learn to control themselves must be killed if all else fails (68 B 261-5, B 253-4, B 257-8).^{liv}

The “rule of the stronger” is “natural” in the sense of being *inevitable* in primitive society. But because of the necessary autonomy of every organic collection of atoms, and the fact that rational persuasion is preferable to compulsion, Demokritos was almost unique among the ancient philosophers in being a convinced democrat. He accepted the inevitability of war between human communities. He also accepted slavery as natural and rationally justifiable. But where he accepts

“religious” sanctions with respect to punishment, we can safely infer the recognition of “convention” (68 B 267, B 49, B 250-1, B 270, B 259).^{iv}

6. Ethics

The largest mass of the fragments of Demokritos consists of short sayings about ethics. Most of them come to us from two collections — the philosophical miscellany of John of Stobi (made in the fifth century AD or later), and an anonymous list of the “sayings of Demokrates.” This second collection has been given to Demokritos because there is a considerable overlap with John of Stobi. Many of the sayings are “ethical common sense”; some have the aura of proverbs. Some scholars (notably Guthrie) would like to reject them all, insisting that they have nothing to do with Atomism. But this is a mistake. The basic connection with the Atomic theory is given by the long fragment 191 (in Stobaeus): *Euthumie* (one of the names for the human good — which I shall here translate as “cheerfulness”) is said to depend on moderation and “symmetry” of life. Things that are in excess or lacking cause disturbance in the soul (i.e. in the atomic patterns). “Souls moved over great intervals [or radii] are neither stable nor cheerful.” One must keep one’s mind on what is possible, and when the situation is bad, one must reflect on how much worse things could be. Above all, one must avoid envying others; and one must avoid doing wrong because of the inner anxiety it will cause.

We already know that in the Atomic physiology, soul-atoms keep company with body atoms. But soul atoms are both round and fast-moving. So they cannot be pinned down; and they *must* move, somewhere and somehow, faster than their bodily charges. The solution of this problem is the hypothesis that the soul-atoms *circle round* the slower-moving bodily atoms whose keepers they are; and the *congregation* of atoms in the head which is responsible for all of the higher functions of mind, must have circular orbits of larger and more complexly interwoven kinds. Demokritos conceives of all immoderate desire as a distortion of the soul-orbit by *elongation*. The more extreme one’s desires are, the more the atoms will be inclined to fly off at the sharp turning points. One must therefore keep one’s psychic condition as moderate as possible by concentrating on what is possible,

and on what the health of the body actually requires.^{lvi} One must not think about what others have, because it is one's own atomic balance that is important. Education can *change* the "rhythm" [of the atoms] in the "nature" of a person (68 B 33). *Human* nature can and should be "made" by educational practice, and the discipline of regular habit.

For the rest, the atomic ethics is bound to be commonsensical, because it cannot be theologically oriented, and because the "legitimate" truth is hidden in the depths. The exploration of those depths, even though it can only produce hypotheses, is actually the highest good achievable, because it is self-satisfying and self-contained. We all "make" our pleasures, by choosing what desires to gratify. But the pleasures of the intellect are self-made in a stronger sense. "I would rather discover one cause than gain the kingship of the Persians," said Demokritos (68 B 118).^{lvii} But at the opposite pole (of bodily necessity) we all have the same needs. So we can all enter into the truly human joys and needs over their whole range; and this is the foundation of human justice: "Man is that which we all know"; and "<all> men shall be one, and <one> man shall be all" (68 B 165 and B 124). Demokritos is not only a philosophical democrat; he is the first rational cosmopolitan: "For a wise man the whole earth is there to walk; for the native land of a good soul is the whole earth." This cosmopolitan faith rests on the insight that "For all men good and true are the same; but pleasant differs for different men" (68 B 247, B 69). (This reflects the influence of his great fellow-citizen, Protagoras.)

It is a disappointment to us to find that this rational freedom is not ascribed to both sexes. "A woman must not practice argument," and "to be ruled by a woman is the ultimate outrage for a man." We cannot say that this was just an unavoidable concession to social convention. We must remember that all of the Greek thinkers — except Plato — held similar views. The universal acceptance of male dominance in his world (both Greek and barbarian) seems to have convinced Demokritos that there is an *atomic* basis for the difference between the sexes that goes beyond their reproductive functions. About reproductive genetics, he was a rationalist equalitarian; but he believes that there is a difference of *intellectual* character between men and women: "A woman is

far sharper than a man in malign thoughts.” Wives should be seen but not heard (68 B 110-1, B 273-4).

This interpretation of his position (which may be thought to have a very slender evidential foundation) is indirectly confirmed by Demokritos’s views about marriage and fatherhood. We can see that he attaches enormous significance to rational friendship (68 B 96-101, B 103, B 106-7, B 109, B 153 — in context). But he does not think that sexual relations can be the basis of proper friendship. Sexual desire is *immoderate* in its very essence: “Coition is a slight attack of madness”; and “Some men are masters of cities, but are enslaved to women.” He agrees with Herakleitos (more generally) that “It is hard to fight with *thymos*; but to control it is the sign of a right-thinking man.” The right policy for the control of sexual desire, apparently, is not to marry or have children in the natural way at all. Marriage and children are the cause of much misery and grief. It is better to avoid the lottery of nature, and to adopt sons who have reached an age where rational judgment of their character and endowments is possible. In the course of nature “a harvest is rare, and even when it exists it is thin and poor” (68 B 275-7, B 72-3, B 32; cf. B 127, A 170).

But if one is going to follow nature — since procreation there must be, and the City *may* make it a civic duty — one should choose a quietly modest wife, without personal vanity, and do one’s best to raise the children rationally; and one should realize that one is only doing what the animals do. One should not expect to profit by it in any way, any more than they do. On the contrary, one should treat one’s children generously. The children of misers are in a most parlous situation. One should set children a good example of thrift and economic management of resources, give them the best education towards rationality that one can, and then divide out all the property that one can spare, to make them independent as early as possible. The object of domestic education should be to “throw up a fortified wall and a safeguard around their property and their bodies.” One should avoid bad language, and even the mention of evil deeds, because words are the “shadow” of actions (68 B 145; cf. B 190). (The atomic ideal of individual rational autonomy is very evident in this conception of education for independence. Atomism was opposed to the emphasis on family and tribal solidarity that was so fundamental in traditional Greek ethics (68 B 274, B 278-80, B 228).

One should seek property and wealth only so far as it is necessary to make life secure. “Poverty” and “wealth” are relative terms. If one’s *desires* are controlled, a small competence is wealth. But moderation of desires does not mean ascetic self-denial. Life is to be enjoyed, and physical health must go hand in hand with mental “cheerfulness.” “Misers have the fate of bees; they work as if they were going to live forever”; and “a life without festival is a long road without an inn” (68 B 229-30, B 283-6).

We have seen that the primitive condition of humanity was extremely needy; and that this produces selfish concentration on the survival of the family group. But selfishness is *not* rational. Necessity drives the self-centered organisms into social groups; and in society, the identification of a rational common good becomes possible. The capacity to identify with all of humanity begins with sympathetic recognition of the needs of one’s nearest neighbors. As Demokritos has learned upon his travels, rational self-sufficiency is lonely. Those who are rich (in the rational sense of having more than modest security requires) should help others in need, and be generous in support of the common enterprises of their own community. But even with the most modest competence one should practice the habit of *sharing*; for “in a shared fish, there are no bones” (68 B 151, B 282, B 255, B 246).

The aphorisms that I have quoted in the last two paragraphs give us a glimpse of what a good writer Demokritos was. If the sands of Egypt, or the caves of the Middle East were to disgorge an extended manuscript of his, I believe that he would take his place near to Plato, and above all other ancient philosophers as a literary master — and I, for my part, have no hesitation in wishing most for one of his *ethical* works. The critics would soon cease to look upon these ethical fragments with disdain, if they could see them in the systematic contexts that they once adorned.

Notes

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- i. Compare also A 1, 30; A 5, A 10. I do not like to reject the testimony of Theophrastos, but he appears himself to have been uncertain. Later writers usually preferred the tradition that Leukippos was a student of *Zeno*. This is quite possible; and it is rather more probable than not, that Leukippos actually spent some time in Elea. His view that the Earth itself “is whirled about the center” (A 1, 30) suggests the influence of Philolaos — or of other Pythagorean astronomers — if he meant that the Earth spins on its axis, as seems to me quite likely. Cf. Chapter 12, notes 15?? and 26 which may indicate *mutual* interaction between Leukippos and Hiketas.
- ii. Aristotle is quite explicit that Leukippos was the senior member of the partnership with Demokritos — 67 A 6, *Metaphysics*, 985b 4.
- iii. This is cited by Aetios (B 2). (But it may have been a chapter in the *Great Diakosmos*.)
- iv. This saying (of Demokritos) should be regarded as a genuine fragment of Leukippos. It might be better translated as “Not-hing *is* just as much as hing,” since the *positive* symbol in the Greek aphorism is not a normal word, but a word-fragment recognizable only through the contrast with its negative. Compare 68 A 37 — Aristotle fragment 208.
- v. There is a valuable survey of this point in P. Curd, 1998, pp. 188-98.
- vi. Aristotle suggests in one place (*On the Heaven*, 303a 8) that the Atomic theory “makes

things out to be numbers.” This is quite unjust to both parties (and only indicates that Aristotle thought the Pythagorean numbers must, or ought to, be space-filling points). But it points also to the crucial importance of mathematical intuition for Leukippos and Demokritos.

- vii. See Chapter 9, p. 000 [181] above.
- viii. Simplicios is here citing Aristotle’s *On Demokritos*). Compare 67 B 1a for the assignment of the terminology to Leukippos. Aristotle’s use of the alphabet was probably suggested by Leukippos himself. He certainly appealed to the obvious fact that all of our different books are composed with the same 24 Greek (or 26 Latin) letters (67 A 9 — Aristotle, *On Generation and Corruption*, 315b 6). (For spontaneous motion in all directions, compare the complaint of Aristotle in 67 A 18 — also 67 A 6.)
- ix. “Truth is in the appearance” — we can simply project what we see to be *possible* in the visible world into the realm of the true beings that are invisible.
- x. Simplicios. Alexander points out that the spontaneity is logically prior to the compulsion (67 A 6). (This will be important when we have to consider spontaneous attraction or repulsion. We must not confuse Leukippos and Demokritos with Gassendi. The Greeks believed in a cosmos that was full of life, not in a *created mechanism*.)
- xi. Compare 70 A 6 (Metrodoros).
- xii. The evidence is late (and bad). But see 67 A 1, 31 — Diogenes Laertios; and the further

discussion below.

- xiii. Aristotle complains that the Atomists ought to explain what sort of motion the atoms have in the void, and what motions are natural to them. This is not something about which he would be careless or mistaken (67 A 6, *Metaphysics*, 985b 19; 67 A 16, *On the Heaven*, 300b 8; 67 A 18, *Metaphysics*, 1071b 31). But the Atomists could not give any precise answer, because no simply mechanical — or “naturally instinctive” — theory would by itself do all that was needed. (This is evident enough from Anaxagoras’ theory of the two modes in which the Cosmic *Nous* acts.)
- xiv. This is from Aetios on Demokritos. This putative divine “mind” does not organize its own body, just as we do not organize ours. It may well have been Leukippos who caused Archelaos to disagree with Anaxagoras about Mind. Also some of Leukippos’ views (and language) were adopted by the author of the Derveni Papyrus text (who was a philosophical monotheist). (See especially W. Burkert in A. Laks and G.W. Most [eds.], 1997, 167-74.)
- xv. Aristotle thought that causal necessity and stable repetition are not a sufficient explanation — *Physics* 252a 32.
- xvi. Aristotle — *On Generation and Corruption*, 315b 9 — gives this as the reason why the “figures” of the atoms had to be infinite. But if we take it to be a comment on the correctness of Protagoras’ view of consciousness, then the quotation from *On Mind* is not as paradoxical as some scholars have thought.
- xvii. The tradition is very confused, because some writers placed Demokritos’ birth impossibly early.

- xviii. For Anaxagoras, 68 A 1, 34. (The story of hostility between Anaxagoras and Demokritos is an evident fabrication — A 1, 35. His recorded comment, “I came to Athens and no one knew me” (B 116) indicates fairly clearly that Anaxagoras was not there at that time; but we don’t know when it was.) For Philolaos, see A 1, 38. The authorities are good here; and Demokritos wrote an essay on Pythagoras.
- xix. 68 B 299 gives a fragment from Clement of Alexandria in which Demokritos boasts that he has travelled more than anyone else, listened to more wise men, written better treatises with proofs than anyone else. But in this instance Clement was probably deceived by a forgery.
- xx. The explicit analogy of the Macrocosm and the Microcosm seems to have begun with Demokritos (68 B 34). It is not found earlier — and even for Demokritos the authority is not very good — being surprisingly late.
- xxi. See for instance, 68 A 15, A 169, A 1, 36; B 118, B 37, B 129, B 146, B 189.
- xxii. From Diogenes Laertios and Hippolytos respectively. Compare 70 A 6.
- xxiii. It is clearly the cosmos of Anaximenes that the Atomists want to account for.
- xxiv. For *stasis* — “strife etc.” — see for example 68 A 37 (Aristotle, Fragment 208, Simplicios citing *On Demokritos*.)

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- xxv. Compare Aristotle, *Physics*, 252a 32 — on “infinity” in experience; 68 A 60 *On Generation and Corruption* 326a 9 and *On the Heaven*, 309a 1 (on weight); also 68 A 61 (Simplicios). The testimony about atomic “weight” is confused, because many writers took the view of Epikouros and identified “weight” with “motion downwards” — see especially 68 A 47 (Aetios).
- xxvi. Compare also the two titles “Great and Little *Diakosmos*.” Probably this organic life was the *Nous* that Leukippos wrote about.
- xxvii. The original theory was taken over from Anaxagoras without any atomic explanation in the report of Ps. Plutarch. I have tried to supply part of what is needed.
- xxviii. The “nourishing” of the *kosmos* may have been suggested by the theory of Philolaos — see 44 A 18 and Chapter 12 above [at note 37]). Aetios (67 A 22) says that the spherical *kosmos* of Leukippos and Demokritos was not “ensouled”; but elsewhere (68 A 74) he reports that Demokritos recognized a “*Nous* in spherical fire” as God; and when we study the theory of our finite consciousness, we can see why Demokritos would have been inclined to endow the *Kosmos* itself with consciousness. (The “cosmic consciousness” would not direct its operations, any more than we can direct our own bodily processes.)
- xxix. See *On the Heaven*, 303a 12 and a 25; and *On the Soul*, 405a 5; for the “close fitting” of fire atoms see 68 A 93 (Aetios).
- xxx. Demokritos (and quite probably Leukippos before him) thought that there were undiscovered planets in the *kosmos* (68 A 92 — Seneca). It is a mistake to suppose that “the other bodies” in 67 A 1 means the fixed stars. The fixed stars are collections of fire on the “cloak.”

Leukippos did not “go back to Anaximander” (Guthrie, II, 420) in this respect. (Of course, if Anaximander has been misreported — as I think — this was impossible.)

- xxxi. Leukippos *may* not have known — or believed — this. But in his case [67 A 1(33)] the account is very brief; and since the testimony of “Italian” influences is as good for him as for Demokritos I have taken the view that Demokritos was actually following his lead.
- xxxii. 68 A 91, A 92 (Milky Way and comets); 68 B 15, A 94, A 95, A 96 (the Earth). Leukippos — 67 A 1, 30 — accepted Anaximander’s drum-shape; the view of Demokritos was almost certainly influenced by the requirements of map-making for the known world. (Perhaps the report is not a theory about the shape of the whole Earth at all.)
- xxxiii. 67 A 78, Aristotle, *On the Soul*, 1404a 1; 68 A 101 (*On the Soul*, 404a 27); 68 A 106.
- xxxiv. Compare Aristotle, *On the Soul* 403a 32ff. (If I am right this is a “Pythagorean” heritage. For the organic mixture see 68 A 102; for ordinary fire 68 A 93 [Aetios].)
- xxxv. Compare also 68 A 104a and A 104 (*On the Soul*, 409a 32 and 406b 15. The quicksilver comparison was a sarcastic comment that Aristotle borrowed from a comic poet.
- xxxvi. When a normally bitter taste becomes sweet (68 A 132) we encounter a difficulty. But Demokritos need not give a “universally necessary” cause for every phenomenon identified by the same name; he can fairly argue that the interactions of a diseased body with the world outside, are different from those of a healthy body.

xxxvii. Compare further Empedokles 31 B 84, A 88, A 86, 7-8.

xxxviii. From Aristotle, *On the Soul*, 419a 15. Probably Demokritos meant the *sunlit* “Void” — but that causes “atomic” problems.

xxxix. Guthrie (II, 447) thinks the simpler version — A 135, 55 — was that of Leukippos.

xl. 68 A 135, 58; 68 A 77 (Plutarch — dreams); 68 A 117 (Cicero).

xli. See especially the context in Sextus.

xlii. For *On Logic* see also A 33 (VI.3).

xliii. E.g. 68 A 101 (*On the Soul* 404a 27); A 112 (*Metaphysics* 1009b 7); *On Generation and Corruption*, 315b 9.

xliv. Compare B 6, 7, 8, 9, 10 and 68 A 111, A 114 (both from Sextus), A 113 (Philoponos).

xlv. See the context in Sextus; and compare 68 B 125.

xlvi. This must be read in the context of 68 A 111 (Sextus).

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- xlvi. See *Tetralogies* VII-IX. 68 B 155 states an atomic paradox. If a cone is cut, are the cut surfaces equal or unequal? The Atomist answer is quite obvious. There *cannot be* a *mathematically* perfect cone in the order of nature. Sometimes the cut must be between equal rows of atoms, and sometimes between unequal rows. (A differential use of the void “solves” the problem. But even in mathematical theory it is *impossible* to state what the “difference” is. The shadow of Zeno is very evident here.)
- xlvi. See 31 A 70 (for Empedokles); and 59 A 116 (for Anaxagoras). Both sources mention Demokritos — and no doubt the succession of thought is correct. For the botanic studies of Demokritos see 68 A 162 (Theophrastos).
- xlix. The tradition about finite life goes back to Anaximander and runs through Xenophanes and Empedokles to Anaxagoras and Archelaos — how it was “atomized” we do not know. (Leukippos thought that even the heavenly bodies were initially lumps of mud that had to dry out before they could catch fire — 67 A 1.)
- l. See Guthrie, II, 473-474 for the general consensus about Demokritos’ theory of culture. For the rehabilitation of Reinhardt’s view in detail see T. Cole (1967). Lucretius depended on the *Large Epitome* of Epikouros; and Epikouros certainly drew heavily upon the work of Demokritos.
- li. This is in the supplement before B 5a. All of the relevant texts are translated and discussed exhaustively in T. Cole (1967). (The real originator of this evolutionary theory of society was Protagoras; but it was probably Demokritos who put it into plain prose — see Chapter 15 [at note 20].

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- lii. See 68 A 75, A 78, A 79; B 166, B 30, B 234, B 175. (There is an implicit justification of Anaximenes' belief that the air is "divine" here.)

 - liii. The rationalization of the "evil eye" through the theory of distorted images is possible — but Cicero must have been deceived by a forger in his claim that Demokritos defended augury by entrail-inspection (*De divinatione* I, 57.131; II, 13.30).

 - liv. Even a good magistrate needs some watching because everyone is affected by his position — see K. Freeman's construal of B 266 — 1962, 115-116.

 - lv. It appears to me that Demokritos ought to regard slavery as a *conventional* institution only — but B 270 seems to imply a "natural" conception of servitude.

 - lvi. Next to 68 B 191 the most valuable clue for the interpretation of the ethical fragments is B 159 in which Demokritos imagines the body bringing suit against the soul for ruining its health by immoderate desires and gratifications. Compare also B 119, B 53, and B 223.

 - lvii. Compare B 146; and for the "making of pleasures" see B 189 and B 235.