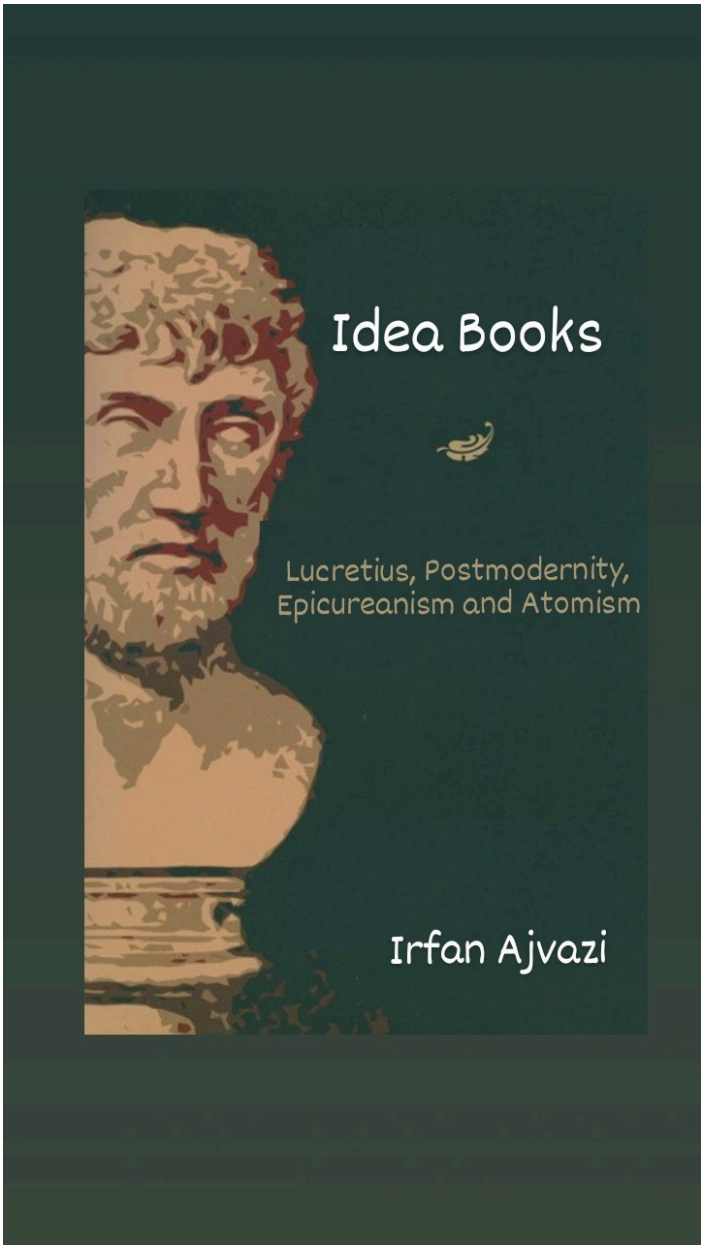
Lucretius, Postmodernity, Epicureanism & Atomism



Abstract: Lucretius made it plain that his poem was designed to liberate man from superstition, the fear of death and the tyranny of priests: \"When man’s life lay for all to see foully groveling upon the ground, crushed, which displayed her head from the regions of

heaven, lowering over mortals with horrible aspect, a man of Greece was the first that dared to uplift mortal eyes against her. . . . but all the more they goaded the eager courage of his soul, so that he should desire, first of all men, to shatter the confining bars of nature's gates. \"

Chapter 1. Lucretius' epistemology (theory of knowledge)

The Roman philosopher Lucretius (98–55 BC), in his poem On the Nature of Things, found it easy to ridicule. He claimed that according to Anaxagoras' theory, \"corn also, when it is being ground by the crushing strength of the millstone, should show often a sign of blood or something of those substances which are nourished in our bodies\". Lucretius took this consequence to be absurd; but Anaxagoras would have had an answer ready for him.

Lucretius made it plain that his poem was designed to liberate man from superstition, the fear of death and the tyranny of priests: \"When man's life lay for all to see foully groveling upon the ground, crushed, which displayed her head from the regions of heaven, lowering over mortals with horrible aspect, a man of Greece was the first that dared to uplift mortal eyes against her. . . . but all the more they goaded the eager courage of his soul, so that he should desire, first of all men, to shatter the confining bars of nature's gates.\"

Lucretius's heroic \"man of Greece\" was Epicurus; but it was really Democritus and Leucippus who first rattled the bars of nature's gates in the name of atomism.
Now then, according to Aristotle, these outlines were first sketched by Leucippus, who was born in around 460 BC. in neither Elea or Miletus, two of the most productive well-springs of philosophy. Democritus was born in about the same year in Abdera, an Ionian city on the coast of Thrace, which somehow became proverbial for the stupidity of its inhabitants.

According to Democritus the word \"atom\" comes from atomos meaning \"uncuttable\", and the atoms of Democritus were held to be absolutely solid, indivisible and indestructible. The force that brings atoms together is the old Greek principle that like attracts like. As Democritus put it: \"Creatures . . . flock together with their kind, doves with doves, cranes with cranes and so on. And the same happens even with inanimate things as can be seen with seeds in a sieve and pebbles on the seashore.\"

It is a very beautiful in its antique Latin, with a beauty that the best translations retain. It is also imbued with passion, which Epicurus might have disapproved of but to which no reader can object. Lucretius was indeed a wild and passionate man, who could see no contradiction in his passionate attempts to convince us that we should be free of passion. On the Nature of Things has much to say about love, but no less to say about death. It begins with love and ends with death; the last book (unfinished, as it turns out, as though Lucretius had died in the writing of it, and if he did kill himself, maybe he did so because he could not finish it) describes at awful length the horrors of the plague at Athens that had killed Pericles and so many other noble souls of heroes and left Athens vulnerable to the tide of Spartan tyranny. From an invocation to Venus, lover of increase, to a paean to Mars, the god of death and dissolution—that is the road Lucretius leads us down.

As others have mentioned the term itself comes from the ancient Greek word (ἐπιστήμη) which means knowledge or science in the broad sense. Curiously however in spite of this etymology the idea of epistemology as an independent branch of philosophy is one associated especially with the modern turn in philosophy starting with Descartes. The Ancient Greek and later medieval thinkers dealt problems of knowledge but mostly in the context of working out metaphysical theories (i.e. ideas concerning the nature of being, reality, the cosmos). Descartes argued you first have to answer \"how do we know? What is the ground of our certitude?\" before you can answer fundamental metaphysical questions about the nature of being. Modern philosophy soon got caught in a debate between the empiricists (e.g. Locke, Hume, Berkeley) who emphasized the senses as the

ground of knowledge and the rationalists (e.g. Descartes, Leibniz, Malebranche, Spinoza) who were more skeptical of the senses and saw pure reason and its grasp of ideas as offering a more certain ground of knowledge. Arguably this debate culminated in the critical philosophy Kant who synthesizing elements of rationalism and empiricism aimed to establish the limits of possible knowledge.

Chapter 2. The Atomic Theory of Lucretius

Like Epicurus, Lucretius was an atomist and a materialist who believed that nature consisted of two fundamental principles, the atom and the void. He also argued against supernatural causes of phenomena in favor of natural ones.

Atoms are imperceptible, so Lucretius must also prove the existence of invisible particles. He appeals to the familiarities of the surrounding world: there are plenty of things we can't see but nevertheless know exist, such as wind and smells; even our drying laundry is proof that invisible particles exist – we can't see the particles of moisture being drawn out, but we can clearly see that they are.
Atoms in the Lucretian universe are accompanied by void – completely empty space, without any particles in it – both outside and within objects. Without it, there would be no motion, because there would be no space without particles in it into which particles could move, and a ball of wool would weigh the same as a ball of lead. Plenty of material objects have void in them, and can be destroyed; but the matter that doesn't have void in it can't be. Atoms and void are complementary: atoms are particles without void in them, and void is space without particles in it.

These, then, are Lucretius' basic principles, and not just of physics, but of argument: he tells us before he begins his arguments that the thing that will shake out the fear and shadows of our minds will be the external

appearance and underlying explanation of nature (*naturae species ratioque*), and that is what he uses: familiar sights from our everyday life, or ridiculous counter-factual situations presented as the logical consequence of failing to accept his principles. Lucretius is seeking to explain the world around us, and uses a vibrant snapshot of that world to prove his point.

Who was Lucretius? No reliable knowledge of the man has come down to us: he is more mysterious than Shakespeare, with whom he has been compared by the philosopher George Santayana:

Poetic dominion over things as they are is seen best on Shakespeare for the ways of men, and in Lucretius for the ways of nature.

If clues exist, the most likely place is a villa in the other town buried by Vesuvius in 79 CE: Herculaneum. Pompeii and Herculaneum are replete with treasures, as the recent exhibition at the British Museum demonstrated once again. But despite over 250 years of excavation, these sites still harbour secrets, none more tantalising than the library of one of the villas in Herculaneum, the Villa dei Papiri, as it is now known.

The Nature of Things is our principal source for the Greek philosophy known as Epicureanism, after its founder Epicurus, who used the physical theory of atomism conceived by Democritus and Leucippus to develop a materialist philosophy that shunned supernatural belief, disavowed terrors beyond the grave, and prescribed a calm life, seeking pleasure within reasonable boundaries.

Although the words are Voltaire's, Epicurus was the originator of the principle \"We must cultivate our garden\". The Bay of Naples was originally a Greek settlement and in Lucretius' day was home to a colony of Greek Epicureans who sought to recreate an Epicurean garden and to live the contemplative life recommended by the master. Lucretius' connection with this community is a matter of speculation.

The original owner of the Villa dei Papiri has been tentatively identified as Lucius Calpurnius Piso Caesonius (fl. 58 BCE), a rich Roman senator whose daughter Calpurnia married Julius Caesar. The library of the Villa dei Papiri, comprising many papyrus scrolls, is the only extant library coming down to us from classical times.

The papyrus scroll was the Roman book: handy to store but cumbersome to read. Herculaneum was closer to Vesuvius than Pompeii and the flow of gases and rock was hotter (up to 400oC). Most of the scrolls were completely carbonized. But hi-tech instruments for probing archaeological remains have reached a peak of forensic excellence. There are now ways of recovering text even from totally carbonized scrolls.

The Herculaneum scrolls clearly constituted the library of an Epicurean philosopher and most of the works are by a single hand: one Philodemus (100-c.40-35 BCE). The eruption of Vesuvius was, of course, much later than this – 79 CE – but the mass of material by this one author makes it likely that the library had been preserved intact from the former era. That it is the working library of a fairly humdrum writer is disappointing but the work of decoding the scrolls will go on for a long time. In 1989 one of them was adjudged to contain fragments from *The Nature of Things*. Given the subject matter of the library, it would be surprising if Lucretius were not represented but the fragments deciphered so far are a very small fraction of the whole. Herculaneum has never been fully excavated and it is very likely that there are further clues to Lucretius in vaults still buried under volcanic debris.

On the other hand no one has such power of perception as to be able to state that there is absolutely no deviation at all from a perfectly straight course.
Then again, if we assume that all motion always goes on in a continuous chain with new motion always arising out of the old in an absolutely determined order; and if the atoms, by means of this swerve, do not initiate a kind of motion that can break through the decrees of fate so that cause may not ' follow cause to infinity, then how can we explain this free will

which we find in living creatures all over the earth? What, I say, is the origin of this faculty of ours which we have wrested from the fates and by which each of us goes where his pleasure leads him, deviating in our motions just as the atoms do at no fixed times or places, but just as our mind takes us? For it is beyond doubt that in these matters it is a man's will that provides the initiative and from it the movements spread through the limbs. You have no doubt observed too that when the barriers are let down at a given moment on a race-course, the strong eager bodies of the horses still cannot burst out into the track as suddenly as their minds in themselves would like to do. This is because the total quantity of matter has to be stirred up together throughout the whole body so that it may then make the collective effort of following the desire of the mind. So you may see that the origin of motion is an act of the intelligence and that this proceeds in the first place from the will of the mind, from it to be passed on further through the whole body and through the limbs. This is not at all the same thing as when we move forward because we are forced to do so by the impulsion of the great strength or great effort of someone else; for in this case it is quite clear that all the matter in the entire body is being pushed forward and hurried along against our will, until the will, operating through the limbs, has regained control. Do you see, then, that, though some external force often drives people on and often compels them to be swept forward headlong against their wills, nevertheless there is something in our breast capable of fighting against this impulse and resisting it? And it is owing to the power of this authority inside ourselves that the whole quantity of matter is sometimes compelled to alter course throughout the body and limbs, and, though pushed forward in one direction, is brought under control and made to settle back again.

You must admit therefore that the same principle holds true of the atoms: that, apart from weight and the blows of one atom on another, there must be another cause for motion, from which comes this power that is born in us, since we see that nothing can be produced out of nothing. It is weight that prevents everything being caused by the blows of one atom on another, as it were by an external force; but it is the minute swerve in the atoms, taking place at no definite time or place, which keeps the mind itself from being governed by an internal necessity in all its actions, and from

being as it were subdued by this necessity so as to be merely a passive subject.

As for the mind itself, or soul (Democritus makes no distinction between the two), it also is, of course, material. It is assumed to be made of particularly round \"*fiery*\" atoms which are distributed over the body. It is through these atoms that we receive the impressions or \"*idols*\" of exterior things. Everything is constantly throwing off \"*idols*\" (a development of Empedocles' \"*effluences*\") and these \"*idols*\" make contact with the soul atoms whether through touch on the surface of the body or through eye, ear, nose or tongue. So much for ordinary sensation. But there is a particular kind of sensation which we call thought. This sensation may be referred to the mind; for, though the mind and the soul are \"*the same*\" in the sense that they are composed of the same round atoms, there is a particularly dense concentration of these atoms in the breast. \"*Idols*\" cannot pass through this dense concentration without moving the soul — or mind — atoms. Hence thought.
The theory is a complicated one. In a short summary it is impossible to do justice to it. A full and excellent account is to be found in Cyril Bailey's authoritative work, ***The Greek Atomists and Epicurus***. Here, too, there is no space to attempt to describe Democritus' cosmogony, his theory of the coming into being of innumerable worlds by means of the action of a \"*whirl.*\" It is clear however that the creation and dissolution of worlds as of everything else is the work of \"*Necessity.*\" Where Democritus speaks of \"*chance*\" he merely means a mechanical cause which to us is unknown. Everything has a mechanical cause in the movements of the atoms in the void.

With regard to Democritus' ethical theory what surprises us most is that in spite of his mechanistic theory of reality he seems not to have been concerned at all with the problem of free will and determinism. He assumes free will to exist and proceeds to elaborate a doctrine of \"*cheerfulness*\" as being the aim of a good life. By \"*cheerfulness*\" he seems to mean the contented, balanced and undismayed attitude of a sensible and prudent Greek of his age. His \"*cheerfulness*\" is not the same as the \"*pleasure*\" of

Epicurus; he accepts the ordinary conventions, such as the importance of the political life. Some of his precepts remind one of the system of Epicurus, but it is quite impossible to say of him, as one must say of Epicurus, that his ethical theory is logically connected with his general system of materialism.

Epicurus, writing more than a hundred years after Democritus (his dates are **342/1-271/70**B.C.) was nothing if not a systematizer. He is sometimes represented as a moralist who, needing a philosophical background to his ethical theories, took over the atomic theory of Democritus and Leucippus and simply tacked it on to his own program of the good life. Cyril Bailey in his study of Epicurus has convincingly shown that this view of the matter is thoroughly mistaken. Epicurus is one of the most consistent thinkers who has ever lived and, far from taking over uncritically the doctrine of Democritus, he made considerable alterations in it — usually, it is true, in order to bring it into a line with his own ethical theory. Thus he founded one of the two philosophical systems which, from the end of the fourth century B.C.) almost until the triumph of Christianity, continued to dominate the minds of the educated. Both Stoicism and Epicureanism can be called \"*creeds*\" as well as \"*philosophies.*\" They were designed not only to explain nature, as thinkers from Thales to Democritus had attempted to do, but to satisfy a modern kind of scepticism which had arisen, at least in part, as the result of historical events. Chief of these events, as was suggested above, was the decline and fall of the authority of Athens and the other Greek city-states. In the world of the successors of Alexander it was no longer possible to think like Socrates or even like Plato, for now there was a sense in which politics did not matter. \"*The city,*\" both as a practical reality and as an ideal, had ceased to exist. The individual, freed from his dependence on the city, had in a way, perhaps, gained wider horizons; in another way he had become disoriented and was in danger of being lost in a world too big for him either to control or to understand. What he needed was assurance in the ordinary operations of life and it was this assurance which Epicurus attempted to give him. Epicurus has been described by Cyril Bailey as \"*the apostle of common sense*.\" He commends the quiet life. Yet it would be wrong to suppose that his creed is lacking in intellectual

acuteness or that it is a mere expression of quietism. Neither Julius Caesar nor his assassin, Cassius, was a quietist.

Lucretius' atomic theory can be understood best by comparing it with the world picture of Plato and Aristotle. In contrast with the finite, single world of Platonic and Aristotelian theory, later adopted by Christian philosophers, the atomists argued that the universe is infinitely large and contains an unlimited number of *cosmoi,* past, present, and future.**3** The single Aristotelian cosmos was without beginning or end in time; there was thus no problem for Aristotelians about the origin of its parts and of their order. The atomic theory, on the other hand, was committed to explaining the origin of everything in the world. Atoms and void were ungenerated and indestructible, but the earth, sea, air, and stars were compounds that came into being at a particular time; their origin had to be explained.

Plato and Aristotle preferred teleological explanations in their natural philosophies. Plato's *Timaeus* offers some grounds for this preference in the notion that the cosmos was created by an intelligent craftsman; the Christian world picture was similar in this respect. Aristotle's eternal cosmos had no creator; the evidence of order and design showed that the cosmos is an ordered whole, but did not point to a designer. Epicurean atomism rejected this teleology, and sought to explain everything by mechanical causes.**4** It was therefore necessary to find plausible explanations for apparently purposive or highly ordered phenomena, and some of Lucretius' most earnest arguments were devoted to this end. The hypothesis of the infinity of the universe was a vital premise in these arguments: in infinite time an infinite supply of atoms moving in infinite space will produce everything that atoms can possibly produce by their coin binations.

The theory held that all atoms are too small to be perceived individually. They are all made of the same material, and have no properties other than shape, size, and weight; their weight is the cause of their natural motion downward through the void. This motion could be interrupted by two causes: an unexplained swerve *(clinamen)*—postulated by Epicurus to

explain the formation of compounds and to free the movements of the soul from \"fate\"—and collisions with other atoms.**6** The perceptible qualities of compounds were explained by relating them to atomic shapes and to the proportion of void in the compound, Atoms in compounds move continually, with very frequent collisions in dense compounds, but more freely in compounds containing a greater proportion of void.

Lucretius presented a simple causal theory of perception: all compounds throw off \"films\" of atoms (*simulacra*) from their surfaces, and these somehow mark their pattern on the soul atoms by direct contact.**8** The soul itself is a mixture of atoms of four kinds—something like heat, something like *pneuma*, something like air. and a fourth unnamed kind.**9** All the soul atoms are highly mobile, but they are not themselves alive; like other atoms they possess no properties other than shape, size, and weight.**10** At death they simply disperse into the air (the theory so confidently rebutted in Plato's *Phaedo*, 70a ff.).**11**
Book V of Lucretius' poem puts the elements of the atomic theory into action, so to speak, to show how the cosmos and all things in it originated from atoms moving in the void, without any divine plan or direction. First the world masses were formed, then the earth began to grow vegetation spontaneously, and finally animal species also emerged from the earth. Once having come from earth, a species survived if it were so adapted as to nourish and reproduce itself; otherwise it simply died out as soon as the earth, growing old, ceased to be spontaneously productive. (The theory thus includes the origin of species and the survival of the fittest, but not the evolution of the species.) It was this account of the natural origin of everything, denying Providence and divine creation, that, along with the denial of the survival of the soul, most antagonized Christian philosophers.

The fatal weakness of the ancient atomic theory, considered as a framework on which to build explanations of natural phenomena, was that it could not offer any laws describing the elementary interactions of atoms. The whole theory depended on the effects of shape, size, and weight of atoms when they collided with each other; but the mechanics of the theory relied on

simple intuitions and analogies, such as the vague principle of \"like to like\" taken over from Democritus. In the ancient world the teleological explanation adopted by Platonists, Aristotelians, and Stoics was clearly more satisfying, especially in biology.

The fervor of Lucretius's arguments, especially the violence of his attack on love at the end of book 4, does not seem to stem from a completely tranquil mind. Yet his poetry is at times magnificent, his hexameters, although not as lithe and graceful as Virgil's, have a powerful and austere majesty. Above all, Lucretius's effort to free men, by science and the power of intellect, from the dark and irrational fears which enslave and torture them has earned him a place among the benefactors of humankind.

Chapter 3. The Epistemology of Epicurus

The problem with the senses is the \"relativity of perception.\" Aristotle cites the contrariness of the sense-perceptions of different persons (the same food being thought sweet by some and bitter by others, for example), of animals other than ourselves, and even of the same person in different situations.

Which, then, of these impressions are true and which are false is not obvious; for the one set is no more true than the other, but both are alike. And this is why Democritus, at any rate, says that either there is no truth or to us at least it is not evident.\" (*Metaphysics*, Book IV, Chapter 5)

Interestingly, Aristotle concludes from this that thinkers, including Democritus, \"say that what appears to our senses must be true,\" which was to become the view of Epicurus. If there is no means by which one set of sense-perceptions can be said to be truer than another, one might conclude that all are equally true, a view which Aristotle denounced vigorously. \"Regarding the nature of truth, we must maintain that not everything which appears is true\" (*Metaphysics*, Book IV, Chapter 5). The source of the error of those who say that all appearances are true is \"that while they were inquiring into the truth of that which is, they thought 'that

which is' was identical with the sensible world\" (*Metaphysics*, Book IV, Chapter 5). Another philosopher who held this kind of view was the Sophist Protagoras, who drew from it a further consequence: \"if all opinions and appearances are true, all statemnts must be at the same time true and false\" (*Metaphysics*, Book IV, Chapter 5). Epicurus did not go this far.

Epicurus's thoughts on the investigation of the true and the false are said to have been laid out in his book *The Canon*. The Greek term translated as 'canon' means 'ruler' or 'yardstick,' a measuring device. Epicurus's canon was gave him a way of measuring opinion (as well as appearance) with respect to truth or falsehood. This work has been lost, so our assessment of Epicurus's theory of knowledge must rely on other of his works, as well as works of his followers and opponents.

According to Sextus Empiricus, \"Epicurus says that there are two things which are linked to each other, presentation and opinion, and that of these presentation, which he also calls 'clear fact,' is always true\" (*Against the Professors*, 7.203). Epicurus himself contrasts opinion as \"what awaits confirmation\" with \"what is already present in sense-perception, and the feelings, and every application of the intellect to presentation\" (*Principal Doctrines*, XXIV). In the *Letter to Heroditus*, he distinguishes the criteria of truth from what is \"non-evident.\"
Sextus adds that for Epicurus some opinions are true and some are false (*Against the Professors*7.211). The reason is that we make judgments upon presentations and we judge some thiings correctly and some badly, either by adding and attaching something to the presentations or by subtracting something from them--in general terms, by falsifying the non-rational sense-perception.\" So opinion is true so long as the right things are added, etc. to the sense-perceptions, but the sense-perceptions are true in themselves.

We have already seen the germ of the radical doctrine that sense-perceptions are all true in the claim that the senses are entirely passive and

cannot be refuted. This claim raises an immediate difficulty. Suppose the sense-perception in question involves the perception of something in front of me as being red. If I make the judgment \"Something in front of me is red,\" it would seem that I am applying one or more basic grasps, e.g., the concept of red, in making the judgment. But in that case, it is not sense-perception by itself that is true, but rather the application of a basic grasp to a perception. It is for this general reason (though perhaps not as it arises in the case of simple perceptual claims) that the Epicureans added to the criterion \"the applications of the intellect to presentations.\"
Supposing that it is judgments of the kind just given that are supposed to be true one and all, the next question is how they can be allowed to be true without violating the principle of non-contradiction (as Progagoras was willing to do). That is, if a piece of fruit tastes sweet to me and bitter to you, how could the judgments based on our sense-perceptions both be true?
A radical interpretation is to hold that Epicurus is not claiming that both judgments are true, but only that both sense-perceptions are real. This claim is based on the ambiguity of the Greek word (*aletheia*), which might be translated as \"reality\" rather than \"truth.\" This interpretation, however, would not account for the debates between the Epicureans and their opponents regarding the consequences of the Epicurean claim, which would be uncontroversial if understood as affirming merely the reality of sense-perceptions. On the other hand, it must be noted that Epicurus responded to the criticism that a vision of the Furies is true by claiming that the person really has the vision. (Sextus Empiricus, *Against the Professors*, 8.63-4).

Another way to understand the claim that all sense-perceptions are true is by holding that the content of judgments of sense-perception are limited in their scope. Rather than judging that the fruit is sweet, I could merely be judging that it tastes sweet to me. This is attributed to the fact that different aspects of an object affect people in different ways
since everything is combined and blended together and since diferent things are designed by nature to fit into different [pores], it is not possible for everyone to touch and grasp the same quality; nor does the obejct [of sense perception] affect everyone the same way with all its parts, but all of

them only experience those parts [of an object] with which their sense-organ is symmetrical; so they are wrong to quarrel about whether the object is good or bad or white or not white, supposing that they are supporting their own sense-perception, since all sense-perceptions make contact with something, each drawing what is compatible and suitable to itself from the compound mixture as though from a spring; and must not assert [things] about the whole when one is in contact with [mere] parts, nor think that everyone has the same experiences according to the differing qualities and powers of it. (*Plutarch Against Colotes*, 109d-e)
This point of view is ridiculed by Plutarch, on the grounds that such a judgment does not reveal anything about the external object. Addressing the Epicurean Colotes, he writes:
[Epicurus] sees what follows better than you do, and he sticks with it: viz. that every presentation on its own account is equally trustworthy and that no presentation is preferable to another, but that all are of equal value. But you are giving up the principle that all [perceptions] are true and that none is unreliable or false if you think that based on these one ought to further pronounce regarding external objects, but did not trust them for anything beyond the experience itself.

The second pair is \"not testified against and testified against.\" Epicurus's example, the opinion that the void exists, suggests that it is intended to apply to cases where the clear facts cannot directly verify or falsify the opinion. The void is a \"non-evident object\" which does not fall within the scope of sense-perception. As Sextus had stated section 210, \"It is a property of sense-perception to grasp only that which is present and stimulating it,\" which is something that the void by definition could not do. Here is is best to start with the positive criterion \"testified against.\" Sextus describes this as \"the joint elimination of the apparent along with the supposed non-evident thing.\" Thus if one holds that there is no void (as the Stoics did), then they are eliminating the non-evident thing, the void. But eliminating the void also eliminates motion, which is something apparent (see the next paragraph). Thus the opinion that there is no void is false.

What verifies the true opinion that the void exists the fact that its existence does not testify against the clear fact of motion: \"for if the void does not exist, then motion ought not to exist, since the moving body would have not place to shift into because everything [would] be full and dense; consequently, since there is motion what is apparent does not testify against the non-evident thing which is the object of opinion.\" As with the case of what is \"not testified for,\" we must be careful to recognize that not being testified against can serve as a tool to judge opinion only when there is a situation where, if the opinion were false, it would be testified against. This interpretation explains why Epicurus could not verify his meterological hypotheses that he outlines in his \"Letter to Pythocles.\" If opinion about the non-evident could be shown to be true simply by being consistent with the phenomena, then when there are several competing hypotheses, they would all have to be said to be true.

[Our aim is] neither to achieve the impossible, even by force, nor to maintain a theory which is in all respects similar either to our discussions on the ways of life or to our clarification of other questions in physics, such as the thesis that the totality [of things] consists of bodies an intangible nature, and that the elements are atomic, and all such things as are consistent with the phenomena **in only one way**. This is not the case with meteorological phenomena, but rather these phenomena admit of several different explanations for their coming to be and several different accounts of their existence which are consistent with our sense-perceptions. (Diogenes Laertius, *Lives of the Eminent Philosophers*, 10.83-116. Emphasis is mine.)

This interpretation, if correct, has consequences for Epicurus's case for the void. This is based on the claim that if there were no void, it would be testified against by the senses, which reveal the reality of motion. But Aristotle had given a **competing explanation** of motion without a void, which would make his claim that there is no void \"consistent with our sense-perceptions.\" Then the theory of the void would be on a par with the meteorological hypotheses, a result Epicurus was trying to avoid. He could do this only by discrediting Aristotle's account of motion within a plenum. But we have no evidence of such an effort.

Epicurus developed an unsparingly materialistic metaphysics, **empiricist epistemology**, and hedonistic ethics. Epicurus taught that the basic constituents of the world are atoms, uncuttable bits of matter, flying through empty space, and he tried to explain all natural phenomena in atomic terms.

The two main issues of Epicurean epistemology may be put as follows: what is the foundation of knowledge; and how is knowledge built on this foundation? There is general agreement that Epicurus proposed to rely on sensory observations as a means of knowing what is unobserved. But there is much debate on the extent to which he proposed to rely on empirical observations, on what he took to be the basic objects of observation, and on how he proposed to proceed from sensory information to the discovery of what is not perceived by the senses.

It has been argued that Epicurus proposed to use empirical observation as the only means of determining the truth or falsity of beliefs. He set out two rules of investigation at the beginning of his physics requiring that the truth and falsity of beliefs rest entirely on sensory observations. The two rules consist of a demand for empirical concepts and a demand for empirical data. The latter consist of uninterpreted, or what may be called ‘raw’ or ‘incorrigible’, acts of perception. Epicurus proposed to infer all truths about the physical world and human happiness from this incorrigible foundation. Against this interpretation, it has been held that Epicurus was not nearly as methodical in his use of empirical observations. Rather, he accepted many nonempirical claims, while proposing to support theories (much like Aristotle) by agreement with perception. Although he supposed that all perceptions are in a sense incorrigible, Epicurus singled out what are ordinarily called true perceptions as the basis for checking scientific theories.

A revival of Epicureanism (especially its ethics and its atomistic teachings) occurred during the Renaissance; its ideas continued to spread during the 17th and 18th centuries and were most consistently developed by P. Gassendi. Epicureanism was also frequently understood in the vulgar sense

—that is, as the cult of sensory pleasures (for example, in ancient Rome, among the philosophers of the Renaissance, and during the Enlightenment in France).

The Epicurean Canon, or rule (from a work, *On the Criterion, or Canon*) held that all sensations and representations *(aesthêsis)* are true and are one of three criteria of truth, along with the basic feelings of pleasure and pain *(pathê)*, and prolepsis (concepts, or \"a recollection of what has often been presented from without\"). It is only when we begin to apply judgment to these criteria that error can occur. Using these three criteria we can infer the nature of a remote or microscopic object or phenomenon. If both prolepsis (naturally acquired concepts) and a number of examples from experience provide the same evidence that something is true, we are entitled to believe it true, on the grounds of *ouk antimarturesis* (lack of counter-evidence).
Epicurus concluded that the **soul** must be a body, made up of four types of atoms and consisting of two parts: one distributed through the physical body and able to experience physical sensations; and a separate part, the psyche, located in the chest, which is the seat of thought, emotion and will. Thin films continuously issue from all bodies and reach the psyche through the pores. Thought occurs when the images constituted by these films are perceived by the psyche. The psyche is free to continually seize only the images it needs from these films.
Sensual perception also takes place when films of atoms issued from the perceived object hit the sense organs.

The Epicurean analysis of *pleasure* and \"*desire*\":
Epicurus deduces from his hedonism that the pleasures we *ought* to pursue must be pure and not admixed with pain. Since pleasure is the sensation which occurs when *desire is satisfied* and the satisfaction of different desires yields different kinds of pleasures (and pains), the trick to *maximizing pleasure and minimizing pain* becomes in effect *knowing what we ought to desire*.

On the other, Epicurus explicitly states that the criteria of truth are, precisely, sensations, preconceptions, and feelings. Since overt disagreement with the Founder is not permissible in the context of the Garden, it is important to examine whether Epicurus' surviving writings might permit or suggest that epibolê too has criterial status. This and other related questions are crucial for the ethical theory as well as the epistemology and scientific methodology of the Garden. For the criteria are supposed to ensure both access to truths and solid grounds for action.

Epicurean Epistemology

Diogenes Laërtius wrote: \"Now in The Canon Epicurus affirms that our sensations and preconceptions and our feelings are the standards of truth; the Epicureans generally make perceptions of mental presentations to be also standards. His own statements are also to be found in the Summary addressed to Herodotus and in the Principal Doctrines. Every sensation, he says, is devoid of reason and incapable of memory; for neither is it self-caused nor, regarded as having an external cause, can it add anything thereto or take anything therefrom. [Source: Diogenes Laërtius: \"The Lives and Opinions of Eminent Philosophers Book X; Epicurus\", A.D. early 3rd century, translated by C.D. Yonge (London: George Bell & Sons, 1895)]
\"Nor is there anything which can refute sensations or convict them of error: one sensation cannot convict another and kindred sensation, for they are equally valid; nor can one sensation refute another which is not kindred but heterogeneous, for the objects which the two senses judge are not the same; nor again can reason refute them, for reason is wholly dependent on sensation; nor can one sense refute another, since we pay equal heed to all. And the reality of separate perceptions guarantees the truth of our senses. But seeing and hearing are just as real as feeling pain.
\"Hence it is from plain facts that we must start when we draw inferences about the unknown. For all our notions are derived from perceptions, either by actual contact or by analogy, or resemblance, or composition, with some

slight aid from reasoning. Even the objects presented to madmen and to people in dreams are true, for they produce effects—i.e. movements in the mind—which that which is unreal never does.
\"By preconception they mean a sort of apprehension or a right opinion or notion, or universal idea stored in the mind; that is, a recollection of an external object often presented, e.g. Such and such a thing is a man: for no sooner is the word \"man\" uttered than we think of his shape by an act of preconception, in which the senses take the lead. Thus, the object primarily denoted by every term is then plain and clear. And we should never have started an investigation, unless we had known what it was that we were in search of.
\"For example: The object standing yonder is a horse or a cow. Before making this judgment, we must at some time or other have known by preconception the shape of a horse or a cow. We should not have given anything a name, if we had not first learnt its form by way of preconception. It follows, then, that preconceptions are clear.
\"The object of a judgment is derived from something previously clear, by reference to which we frame the proposition, e.g. \"How do we know that this is a man?\" Opinion they also call conception or assumption, and declare it to be true and false; for it is true if it is subsequently confirmed or if it is not contradicted by evidence, and false if it is not subsequently confirmed or is contradicted by evidence. Hence the introduction of the phrase, \"that which awaits\" confirmation, e.g. to wait and get close to the tower and then learn what it looks like at close quarters.
\"They affirm that there are two states of feeling, pleasure and pain, which arise in every animate being, and that the one is favorable and the other hostile to that being, and by their means choice and avoidance are determined; and that there are two kinds of inquiry, the one concerned with things, the other with nothing but words. So much, then, for his division and criterion in their main outline.

Chapter 4. Lucretius Theory of Evolution

De Rerum Natura consisted of three pairs of books. The first pair dealt with atoms, the second with the soul, and the third with the cosmos and

mortality. The philosopher-poet subscribed to some of the misconceptions of his day — spontaneous generation, geocentricity — but presented notions completely in line with modern scientific thought. He argued that living things and inanimate objects are composed of incredibly small particles (atoms), an idea first proposed centuries earlier but not generally accepted in Lucretius's day, or for centuries afterwards. He argued that, although the particles are constantly moving and configuring themselves into new forms, the particles themselves are eternal.

Lucretius explained earthquakes as rock masses falling through giant underground caverns — not a completely valid explanation, but he was arguably onto something in connecting the natural hazards to what happens under the planet's surface.

Lucretius also advanced the idea of evolution. He argued that nature experiments endlessly, and the organisms that adapt best to their environment have the best chance of surviving — until conditions change, anyway. A believer in spontaneous generation, Lucretius nevertheless felt that the \"worn-out Earth\" that had once spontaneously made large beasts was now reduced to making just tiny, lowly animals. Like other Epicureans, he challenged the assumption that humans are necessarily superior to animals, noting that mothers in the wild recognize and nurture their babies as do human moms.

Although an Epicurean who saw no inherent evil in the pursuit of pleasure, Lucretius didn't believe that humans originated in some mythological paradise. Instead, he figured that the lives of early humans were particularly tough, especially since they lacked fire and agriculture. Civilization brought advances, but at a cost, and Lucretius remarked that the shipwrecks, wars and even overeating of his own day brought about higher mortality rates than the earliest humans had suffered.

When Lucretius lived, many of his contemporaries believed myths of monsters and gods who destroyed them, often in acts of vengeance.

Lucretius scoffed. He scorned the notion that lightning bolts were hurled by angry gods at erring humans. Why, Lucretius wondered, didn't powerful gods have better aim? Some bolts allegedly thrown by Zeus, the poet pointed out, hit the god's own temple.

All things, including the species to which you belong, have evolved over vast stretches of time. The evolution is random, though in the case of living organisms, it involves a principle of natural selection. That is, species that are suited to survive and to reproduce successfully, endure, at least for a time; those that are not so well suited, die off quickly. But nothing – from our own species, to the planet on which we live, to the sun that lights our day – lasts forever. Only the atoms are immortal ...

p.s. Lucretius also describes atoms, but that is less apparently anachronistic.

In ancient Greece, some of the pre-Socratic natural philosophers (like Empedocles and Democritus) developed materialist or mechanist explanations for how the world and all living beings in it could have emerged by natural causes without any divine design or purpose. In some of Plato's dialogues--particularly in book 10 of the *Laws* and in the *Timaeus*--this anti-teleological cosmology was rejected as a dangerous atheism that would subvert the moral and political order of human life. Plato's Athenian Stranger (in the *Laws*) argues that everyone in the political order he proposes must believe that the gods exist, that the gods think about and care for human beings, and that the gods enforce justice by rewarding the good and punishing the bad. Those people who openly question this cosmic theology should be imprisoned, and if they cannot be persuaded to accept this theology, they will be punished with death. Plato's Timaeus argued that people should be taught that everything was created by a divine Demiurge or Craftsman assisted by other gods according to a model of an eternally enduring nature, so that the cosmos could be seen as the best of all possible worlds.

Later, Epicurus challenged this Platonic cosmic teleology by developing his own anti-teleological cosmology based on the atomistic science of

Democritus. Everything could be understood as the patterns of order arising from the combining and dissolving of atoms moving in a void, so that all possible combinations of these atoms would arise as worlds coming into being and passing away. All life is mortal, so there is no afterlife, and no divine judgment of human beings after death. The gods exist, but they live outside the world of human experience, and they do not care for or intervene in human affairs. All of the organized religions that teach that the gods have created the world and judge human beings both in this life and in the afterlife deprive human beings of happiness by promoting a fear of death and of divine judgment that creates unnecessary and unreasonable anxiety.

Epicureans can be happy because they don't fear god, they don't worry about death, they know that the goodness of pleasure is usually easy to get, and they know that the badness of pain is usually easy to endure. This is possible because their freedom from religious fears and their understanding of how everything is ultimately explained by natural causes allows them to live out their mortal lives with tranquil minds.

Although Epicurus wrote many books, most of his writing has been lost, and we now have only fragments quoted by other writers. The most extensive text of Epicurean philosophy is the Latin philosophical poem of Lucretius--*De Rerum Natura* (On the Nature of Things)--which he wrote sometime before his death in 55 B.C. Although he does not mention Plato by name, Lucretius can be seen as defending the Epicurean anti-teleological cosmology against the Platonic teleological cosmology, particularly as it was reformulated by the Stoics.

Christian theologians were able to accept modified forms of the Platonic and Stoic cosmology of divine creation as compatible with Biblical creationist theology, which became the predominant model of the cosmos in Christendom for over 1,500 years. But Christians had to scorn the Epicurean/Lucretian cosmology of materialist atomism as promoting a dangerously atheistic view of the universe.

The second problem is that it's not clear that Plato or Plato's Socrates endorse Timaeus's story of cosmic creation. Timaeus's story is so utterly ridiculous that many readers have doubted that Plato takes it seriously. A. E. Taylor, for example, made this point, but Campbell casually dismisses this and insists that Timaeus's story must be seen as a serious teaching of Plato (2000, 158). But Campbell doesn't explain the many strange features of this dialogue. First of all, it's not much of a dialogue. After some brief exchanges between Socrates and Timaeus, Timaeus launches into a long lecture that takes up most of the book. Socrates remains silent, which suggests that Timaeus's story cannot withstand any Socratic questioning. Timaeus says that his story will be a \"likely myth.\" Socrates says that it will be a *nomos*--a song, a custom, or a law (*Timaeus* 29d). So Timaeus's story is not a reasoned account of the cosmos.

Moreover, what Timaeus says is often self-contradictory. For example, Timaeus says that the best account of astronomy depends on sight--looking at the stars and the Sun--and this shows the primacy of our eyes for our knowledge of the world (47a-c). But then he condemns as \"light-minded\" the empirical astronomers who believe that our knowledge of astronomy must begin with what we can see with our own eyes. Such people are punished by being turned into birds (91d-e).

In Book 5 of *De Rerum Natura*, Lucretius explains the origin of all living beings as the spontaneous generation of life from the Earth (5.785-1012). Just as today we can see the spontaneous generation of worms and cicadas from the Earth, Lucretius claims, we can imagine that at the beginning the Earth was so fertile that it could generate all forms of plant and animal life (2.871-72, 898-901, 928-29, 3.719-36, 5.797-98). For this reason, Lucretius observes, the Earth has rightly been called the Mother of all life.

At first, the Earth experimented with many monstrous animal bodies with grotesque appearance--such as animals that were both male and female, animals without feet or hands or mouths. These forms of life \"were created in vain,\" because nature extinguished them. They died from starvation. Or

they could not reproduce. Or they could not compete with other animals. Only those species adapted for survival, reproduction, and competition were naturally selected for preservation. Those human beings who lived in these early days were tougher and larger than human beings today. They lived as solitary foragers and like savage beasts, with no families, no farming, no customs or laws, no use of fire or clothing. Men and women came together for sexual copulation and then separated with no enduring attachment. (Here is where Rousseau found his first \"state of nature\" of \"nascent man\" for his *Discourse on the Origin of Equality.*)

Some modern commentators have argued that this Lucretian account of the origin life is refuted by modern science. One criticism is that Lucretius speaks mythically of Mother Earth as a teleological creator. Another criticism is that the belief in the spontaneous generation of life was refuted by Louis Pasteur's famous experiments showing that living organisms cannot arise spontaneously from lifeless material. A third criticism is that the modern fossil and archaeological record shows an evolution from simple forms of life to more complex forms, including a human fossil record showing human evolution over millions of years, which denies Lucretius's claim that all forms of life originated simultaneously and his claim that the first human beings lived as utterly solitary animals who lived on raw food without fire for cooking.

Although there is good evidence for this interpretation of Lucretius, there is some ambiguity here, particularly in what Lucretius says about the origins of fire and cooking (5.955-58, 1012-20, 1091-1104). Lucretius says that the first primitive human beings were tough enough to live on raw food like other animals. They had no knowledge of how to use fire for cooking. But then from observing the effects of wild fires and the warming of the Sun, they learned how to cook their food, which was part of a suite of changes that allowed them to live in family settlements that made them fully human for the first time. In his comments on this section of Lucretius's poem, Campbell observes: \"Humans become truly human, and finally civilized when they have been mastered by fire, marriage, and love, and when they in turn master nature with new technologies. Fire and cooking were chief

among these\" (2003, 329). This shows the \"process of becoming fully human\" (2000, 154-55).

Doesn't this imply that those first primitive human beings who lived totally on raw food were not \"truly human\" at all, and so what we see here is evolution from a non-human but somewhat human-like animal species to a fully human species? If so, then this points to human evolution as inter-species evolution. Lucretius could not elaborate this idea explicitly because he did not have all of the empirical evidence available today for human evolutionary emergence from primate ancestral species.

That evidence--from fossils, archaeology, primatology, and evolutionary anthropology--confirms the truth of Lucretius's insight about the importance for human evolution of controlling fire for cooking. Richard Wrangham has surveyed this evidence in support of his \"cooking hypothesis\" for explaining human evolution (Wrangham 2009; Gowlett and Wrangham 2013). No human societies have ever relied on raw food for most of their diet. And no human beings have been known to survive for more than a few weeks by eating only wild raw food. Unlike every other animal, human beings need a large portion of their food to be cooked. Compared with the great apes, human beings have a reduced digestive system--small molars, mouth, stomach, and large intestine--that is adapted for digesting cooked food. Moreover, the brain is a metabolically expensive organ that requires lots of energy; and therefore the increase in the size of the brain that characterizes human evolution required a reduction in gut size and energy costs and the consumption of higher quality cooked foods to reduce the metabolic constraints on brain size by delivering increased energy to enlarged brains. The evidence of the hominin fossils indicates that *Homo erectus* had such enlarged brains that would have required digestive systems needing cooked food. There is also some archaeological evidence for the controlled use of fire appearing at around 1.5 million years ago, at the time of the first major increase in the brain size of early *Homo*. All of this evidence suggests that what Lucretius describes as a transition from primitive humans living \"in a manner like wild animals\" (*more ferarum*) (5.932) without fire and cooking to fully human beings living with

fire and cooking was actually an evolutionary transformation from a pre-human species to a truly human species.

Lucretius, living from 99-55 B.C.E., also argued in favor of a theory of evolution. Lucretius laid out his evolutionary theory in his poem titled *On the Nature of Things*. He followed his predecessors by claiming that the earth gave birth to its creatures through a combination of elements. For Lucretius, the force that is responsible for life's creations is chance.
In keeping with the strangeness of **Empedocles**, Lucretius claimed that a type of natural selection caused monster-like creatures to die-off, and that the creatures which survived did so due to their capacity for strength, speed, or intelligence. Lucretius parted with Anaximander by claiming that a land animal could not evolve from a creature of the sea, and he was skeptical that one species could evolve out of another.
In sum, these three natural philosophers of the ancient world believed that through a combination of natural elements, acted upon by natural forces, both the universe and the living beings within that universe were created. They chose natural explanations as opposed to supernatural or superstitious claims for the creation of the cosmos and its inhabitants. Though I might point out that other aspects of their philosophy did contain elements of the supernatural or superstitious.

Chapter 5. Epicurus and Epicureanism

The Epicurean ethics is materialistic. Justice and values that rule society are not eternal as in Plato, but the result of the convention. The aim of the wise man is happiness, and happiness is the state that provides the untroubledness or ataraxia. How can we achieve it? Through pleasure. However, for Epicurus pleasure was the absence of pain. What does a just born child desire? Not to be hungry, not to be thirsty, not be not cold. The man who has this basic needs satisfied and has the hope to be satisfied in a future would rival Zeus in happiness. The Epicurean pleasure is not the dissolute's; it is provided by peaceful life without fear and pain. Epicurus gave great importance to friendship. In fact, his school was a group of

friends where slaves and women were admitted, some of them not very good reputed.

According to Diogenes Laertius, Epicurus wrote more than any other philosopher before him. It seems that he left about 300 volumes, unfortunately, their works are lost almost entirety.
Of this immense work, Diogenes Laertius saved and published in his book Lives, doctrines and rulings of the most illustrious philosophers, the Letter to Herodotus, the Letter to Pythocles and the Letter to Menoceus, even the second —although Epicurean for its content— is considered spurious.
In addition to these three letters, we own the so called Basic Doctrines, a series of brief advices, focusing mainly on ethics, several scattered fragments, and the so called Vatican Sayings, a collection of sentences discovered in 1888 in a Vatican codex, some which are identical to the Basic Doctrines.

To this scanty material for the study of first hand sources of Epicureanism, we have to add the collection of papyri that are recovering slowly from the library of Philodemus of Gadara, an Epicurean who lived in the first century AD. His house, located in Herculaneum, in the Bay of Naples, had a library with many rolls of papyrus of philosophical works, many of which were books of Epicurus himself. With the eruption of Vesuvius in 79 AD the town was completely buried, and so and forgotten remained the papyri for centuries, until in 1738 Herculaneum began to be excavated. The papyri found in the library of Philodemus are completely charred and without unrolling, so that a large technical expertise and philological skills are needed to recover their content.

Epicurus divided his philosophy into canonical, physics and ethics.
The canonical or Epicurean theory of knowledge is fundamentally materialistic and empiricist. The knowledge that we get is reduced to the senses, and all five senses can be reduced to the touch. Through our senses

we contact with external bodies and acquire knowledge. The senses never deceive us, the error lies in the inferences we extract from the information that they provide.

Chapter 6. Knowledge of Atoms in Epicureanism

Knowledge of the external world must be some kind of reaction between the atoms of the external world and the atoms of the thinking man; and the only reaction in the atomist's theory is simply collision. That is to say, the connexion between the thinking subject and the external world is nothing but touch: utactus enim, tactus, pro divum numina sancta" as Lucretius strenuously insists (2. 434). The Atomists are then ready to show how all our senses are really varieties of the sense of touch; each faculty of sense is stimulated by actual contact with suitable formations of atoms proceeding from the external world.
It is a picture which has a certain plausibility as a theory of sensation. And the atomists liked to say that sensation is indeed the basis for all our contact with the external world. The paradox of course is this: if knowledge comes to us by means of sensation, how are we to explain the atomist1s knowledge of the basc propositions of his special theory: that the world consists of void, which is called "the intangible", and atoms, which are said to be imperceptibly small?

There is enough textual evidence in Epicurus himself and Lucretius to show There they may produce a phantasia or image, which is similar to the images produced by sensation. The experiences which the Epicureans hoped to explain by this thesis were dream-visions, certain types of imagination (in the modern sense), and especially ideas about the gods. The texts which serve as our evidence for this theory do not speak of the fundamental propositions about atoms and the void. It is my belief that this theory was strictly limited to the explanation of those experiences with which it is associated in the surviving texts.

Sentence D. Error occurs when such an image is wrongly assessed by the "second rr.otion" (.!?.£. of soul atoms) "in ourselves": it is treated as a clear image, resulting fr01n a steady stream of eidola, when it is not.
Here, then, epibole tes dianoias occurs in the explanation of illusions of many kinds. This surely should have been enough to give Bailey pause. What kind of a concept is it that is the explanation of illusory dreams and visions, the guarantee of scientific truth? If this phrase is to mean "an act of deliberate attention" is it not disconcerting to find it in an account of dreams?
At this point we can turn to the other approach to Epicurus' idea of his knowledge of the atomic theory: that is, the method of argument used to defend it. First, it may be worth saying that Bailey and Cornford were probably distracted from this approach by the notion, which seems to me mistaken, that
we must look for the distinguishing characteristics of an empirical theory in the manner in which the theory is first reached, rather than the manner in which it is defended. As against this, I agree with Popper, who wrote at the begin ning of his Logic of Scientific Discovery, "The question of how a new idea occurs to a man may be of great interest to empirical psychology; but it is irrelevant to the logical analysis of scientific knowledge.

He continues at once: HAbout things that are unclear, we must get the following points made and keep them in mind. First that nothing comes to be out of that which does not exist; for everything would in that case be coming into being with no need of seeds."
Notice the very simple method: he asserts his thesis, then makes its contradictory the protasis of a conditional statement, of which the apodosis is a proposition falsified by sense-perception. "P. For, if not-P, then Q, which ris observed to be f alse".
We have very nearly the same pattern repeated frequently, and especially in the argument for the existence of void, which became famous and much talked about in antiquity -- indeed it was famous before Epicurus used it at all, for it was used in the reverse direction by the Eleatics, 19 and was almost certainly borrowed from them by Leucippus and Democritus.20

First Epicurus notes that the existence of somata is confirmed by the direct evidence of the senses, "which we must use for making inferences about what is unclear by reasoning {logismos)". He goes on, 11 If there did not exist that which we call void and space and untouchable nature, bodies would have nowhere to be or to move, as they are observed to move.11
The schema is this: "Void exists: for if void did not exist, there would be no motion, which we observe to be false.iv
A century or more after Epicurus, when Stoic logic was developed into a systematic study, this pattern of inference was formalized and grouped with other similar patterns. It is in fact the second of the undemonstrated arguments collected by Benson Mates (Stoic Logic, p. 71): "If the first, then the second Not the second; therefore not the first,n with negative propo sitions substituted for the propositional variables.

The Stoics, with their new interest in logic and epistemology, attacked the Epicureans. Although the Epicureans were probably never much interested in
logic as such, they evidently felt impelled to offer some sort of reply to Stoic criticism. We have evidence of their replies in the Epicurean work by Philodemus, called On Signs, which partly survives in the form of badly mutilated papyrus fragments. It was published by Gomperz in the 1860s, and there was a further study of it by Philippson in 1909 and 1910, so there was no excuse for Bailey's total neglect of it in his books on Epicureanism; though of course he did not
have the advantage of Professor DeLacy's edition of it.

However let us look at some Epicurean arguments of a different type, where the appeal to sense-perception is less obvious.
One example is the argument with which Epicurus supports his theory of to en te atomo elachiston, or minimae partes, as Lucretius calls them.22
There are other ways of reading this argument, but if I am right about it, it includes the following: Suppose that an atom contains infinitely numerous parts, each

of them having size: it is impossible, in that case, to see how it can still be finite in size, since the parts must all be of some size, and if they are infinitely numerous, the total must be infinitely large. Hence we must not suppose that the atom is infinitely divisible.
This argument contains the expression ouk esti noesai, "it cannot be thought11, "it is impossible to see". Does this indicate some appeal to a kind of direct intuition? Are we perhaps supposed to make use of the epibole tes dianoias, and rely on its negative report: "It is not possible to see how a finite body can have infinitely numerous parts.

Epicurus should not use the word alethes of the primary impressions of the senses or the mind. It would be better to say they are neither true nor false. But it is quite clear that he does use alethes in this sense, since
he is quoted as saying that ''the illusions (phantasmata) of madmen and dream- visions are true11• The explanation is added: "they are true because they
move (the sufferer), and what does not exist does not cause movement,.

So I suggest that Epicurus is not saying, as Bailey thought, that ·s inference from the seen to the unseen in this case is wrong, whereas the inference of JWibole to the unseen is always right: he is saying that it must be ·s inference to the unseen that is wrong in these cases, because the error never lies in the mental picture itself. He is not saying that direct mental apprehension infallibly tells the truth about the external world, but only that our mental images are not the level at which mistakes occur.

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of them having size: it is impossible, in that case, to see how it can still be finite in size, since the parts must all be of some size, and if they are infinitely numerous, the total must be infinitely large. Hence we must not suppose that the atom is infinitely divisible.

Epicurus uses the analogy between the visible and the intelligible: he regards this as valid. But we
might suppose that there is likewise an analogy between the minimum and multiples of the minimum in the visible field, and conclude that because we can distinguish parts of something that is larger than the minimum we must be able to distinguish parts of the minimum itself, since it is the same kind of stuff. This analogy obviously has to be rejected. Epicurus goes on at once to reject another one:if we say the atom has parts, we might be tempted to think that it could be resolved into its parts like compound bodies in the sensible range: but this again is obviously false. The reason why the analogy can be seen to be invalid on both these cases is just that the conclusion yielded by the analogy has already been falsified by another argument. We know already that there is a minimum visible quantity, and that atoms are indissoluble.

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Chapter 7. Atomism, Natural Philosophy and Lucretius

Atomism is the belief that simple, indivisible particles are the basic components of the universe. These basic components are called atoms, hence the name atomism. Although this may sound very modern, atomism finds its roots in ancient Greece and was heralded by the philosopher **Epicurus**. Epicurus took atomism and made it applicable to human life. He purported atoms, which are the building blocks of all nature, exist and function without the intervention of celestial gods or outside forces. In other words, neither the Greek gods of Mt. Olympus nor any other gods are calling the shots when it comes to nature. Of course, this an affront to the belief in the supernatural, but it is mild in comparison to the works of Lucretius.

Lucretius believed that unhappiness stemmed from fear of the gods.

On the Nature of ThingsHuman life lay foul before men's eyes, crushed into the dust beneath religion's weightSatisfy us in the morning with your unfailing love, that we may sing for joy and be glad all our days (Psalm 90:14).

Although Lucretius never came out and denied the existence of gods, he believed religion brought bondage to man.

emocritus's atomistic universe:

Atoms move about in the void (empty space), collide, attach to others to form compounds. These compounds can have secondary qualities, but such qualities can be reduced to the primary qualities of their component atoms. Cf. **31**=A129:

He makes sweet that which is round and good-sized; astringent that which is large, rough, polygonal, and not rounded; sharp tasting, as its name indicates, that which is sharp in body, and angular, bent and not rounded; pungent that which is round and small and angular and bent; salty that which is angular and good-sized and crooked and equal sided; bitter that which is round and smooth, crooked and small sized; oily that which is fine and round and small.

1. **Determinism**The picture is entirely **mechanistic**. The movement of atoms is explained without recourse to reasons, motives, Mind, the Good, Love, Strife, as was common among other Presocratics. Our only fragment from Leucippus attests to this (**1**=B2):
   No thing happens at random but all things as a result of a reason and by necessity.
   This is causal **determinism**.
   1. An individual atom has no choice concerning its movements. If pushed, it moves. Its \"motivational forces\" are all external.
   2. The compounds of atoms don't have any choice, either. For their movements are all a function of the movements of their component atoms. **The movement of an entire system of atoms**

is just the sum of the movements of all of its individual component atoms.

3. Explanations are **bottom up**, not **top down**. That is, the movements and behavior of a compound of atoms (e.g., a tree, an animal) are to be understood as the sum of the individual movements of all the atoms composing that compound. Thus, one explains why the tree or animal moves in such-and-such a way by explaining why each of its component atoms moves as it does. (It is this kind of explanation that particularly exercised Plato, who thought this idea was a colossal mistake. Cf. *Phaedo* 98c)

1. **Ancient vs. Modern Atomism**This very compelling world-view has given rise to a mechanistic, deterministic, point of view that has been even more popular in modern times than it was in ancient times. (Contemporary problems about deterministic physics arising from quantum mechanics have considerably weakened the support for this point of view. The classical Newtonian view that quantum theory has replaced is basically Democritean.)
   The ancient atomists may appear to have provided a brilliant anticipation of a much later scientific theory. But is this picture accurate? Our enthusiasm for the achievements of the ancient atomists must be tempered by a closer look at the basis of their view.
   Their impetus did not come from **physical** inquiries, but from the **logical** and **metaphysical** positions of Parmenides and Zeno. As Barnes says (*Presocratics*, p. 346: \"the first atoms came from Elea.\" Atoms were postulated in response to the Eleatic view that a truly real entity must be **one** and **indivisible**. So we must ask:**In what sense were Democritus's atoms indivisible?** Democritus might have meant either of the following:
   1. It is **physically** impossible to divide an atom.
   2. It is **logically** or **conceptually** impossible to divide an atom.If (a) is the Democritean position, then it would make **sense** to talk about the **parts** of an atom - there might even **be** such parts - although it would not be physically possible to separate the parts.

If (b) is what Democritus maintained, then this sort of talk makes no sense. The very idea of \"splitting an atom\" would represent not just a technological difficulty (or even a technological impossibility) but a conceptual absurdity.

2. Opinion is divided on this issue.
    1. In favor of (a) are
        1. **Burnet** (*EGP*, p. **336**):We must observe that the atom is not mathematically indivisible, for it has magnitude; it is however physically indivisible, because, like the One of Parmenides, it contains no empty space.
        2. *KRS*, p. **415**: [An atom] is presumably only physically, not notionally, indivisible, since for example atoms differ in size.
    2. In favor of (b) are
        1. **Guthrie** (vol. **2,** p. **396**): Democritus held that his atoms, being not only very small but the smallest possible particles of matter, were not only too small to be divided physically but also logically indivisible.
        2. **Furley**: I will give a quick sketch of the case he makes for (b).
3. Furley's argument for theoretically indivisible Democritean atoms:
    1. Aristotle says that atoms were postulated to meet (what he called) Zeno's \"Dichotomy Argument.\" This would be either the paradox of the race course, or the paradox of plurality.
    2. But, as we have seen, both of these arguments of Zeno's are meant to show that infinite divisibility (whether physical or theoretical) leads to absurd results. Hence,
    3. The atomists would not be meeting Zeno's argument unless they conceived of atoms as **both** physically and theoretically indivisible. **Furley** (p. **510**):A theoretically divisible atom would not answer either of Zeno's arguments. [The plurality paradox] would show that an atom theoretically divisible to infinity must be infinite in magnitude; and [the race course] would show that such an atom could never be traversed -that is, if one starts imagining it, one can never imagine the whole of it.
4. Furley's conclusion is supported by further evidence from Aristotle, who claims that atomism conflicts with mathematics (*De Caelo* 303a20):

They must be in conflict with mathematics when they say there are indivisible bodies.
But an atom that is (merely) physically unsplittable would not conflict with mathematics.
If this interpretation is correct, and atoms are theoretically indivisible, then the differences between the Democritean view and modern scientific atomism are greater than the similarities.
Objections to theoretically indivisible Democritean atoms.

1. According to Simplicius, Democritus thought that atoms had **size** and **shape**:**5**=A37: *For some of them are rough, some are hooked, others concave and others convex, while yet others have innumerable other differences*. **27**=A14: *These atoms, which are separate from one another in the infinite void and differ in **shape** and **size** and position and arrangement, move in the void . . . .*

2. But it is hard to see how someone could conceive of atoms as having size and shape, and still being theoretically indivisible. For it would seem that, for any size *x*, we can always think of something that is only half that size: we can always divide *x* by 2.

Chapter 8. **Zeno's** <u>**Paradox of the Arrow**</u>

Zeno's argument that an (apparently) moving arrow is really at rest throughout its flight seems easy to evade if one insists that space is continuous (and hence infinitely divisible). But an atomist who insists on theoretically indivisible atoms seems bound to deny that space is infinitely divisible. And Zeno's Arrow Paradox poses an especially troubling problem for such an atomist.
For how will the arrow (or any object, in fact) move through an atomic space? Since the space cannot be divided, the tip of the arrow must advance from one end of the space to the other without ever having occupied any of the intervening space. At one moment, $t1$, it's in one place, $p1$; at some later moment, $t2$, it's in another place, $p2$. But if you pick any time t_i that falls between $t1$ and $t2$, the arrow is either still at $p1$ or already at

*p*2. It **never moves** from *p*1 to *p*2, because the space from *p*1 to *p*2 is atomic and therefore cannot be divided.
Although we cannot, of course, be certain that Zeno intended his Arrow Paradox specifically against the atomists, it constitutes a formidable objection to an \"atomic\" conception of space.
(Nevertheless, physicists are still enamored of the idea that space and time come in discrete \"quanta\" which cannot meaningfully be further sudivided, even conceptually. If you want proof, check out this **New York Times article** of December 7, 1999.)

1. **Do atoms have shape?**Finally, let us consider Democritus's idea that atoms have **shape**:
    1. Democritus did not think that atoms merely had magnitude. He thought that they had **different** sizes, and **shapes**. And this seems to conflict with the idea that there are atomic sizes. For how could one atom be larger than another unless one of them were either larger than (or smaller than) the atomic size?
    2. Perhaps Democritus thought that there was a smallest size atom, and the size of **that** atom was the atomic unit of measurement. But if that atom has a **shape**, the view seems to unravel. Cf. **Furley** (p. **521**):Democritus' atoms had many variations in shape and size. There seems to be an inescapable contradiction here. If we take together a smaller atom and a larger one, we can always distinguish in the larger one that part which is covered by the smaller and that which is not. Even within the limits of a single atom, supposing it to be of a complex shape (say hook-shaped), we can always distinguish one part of the shape from another (say the hook from the shaft).
    3. Furley concludes that Democritus did, indeed, think of his atoms as being **both**theoretically indivisible **and** differing in shape, and that his view was therefore internally inconsistent.
    4. For more on this interpretation, see **Guthrie**, vol. **2**, Appendix, pp. **503-7**.For an opposing view, cf. **Barnes**, *Presocratics*, **352-360**.

Barnes considers the idea that Democritean atoms are theoretically indivisible, in three different senses: conceptually, geometrically, and logically indivisible. He argues that the available texts do not adequately support the idea that atoms are theoretically indivisible, and concludes that the case has not been proven either way.

5. Zeno's Arrow Paradox is a philosophical argument about motion. Indeed, it argues that motion is impossible. Imagine an arrow fly through air. Zeno argues that time is composed of moments and a moving arrow must occupy a space \"equal to itself during any moment\". Basically, at any indivisible moment (or instant) it is at the place where it is. (Duh!) But of course \"places\" themselves cannot move. So, the arrow is not moving in that moment. Here the main argument is that motion requires time (which sounds reasonable) Of course the same reasoning holds for any other moment. So we must conclude that, the arrow is never moving.
To translate to simpler language: Time is just many many moments. A flying arrow cannot be moving at any single moment. Therefore it cannot move at any moment. Therefore it cannot move!

Chapter 9. Epicurus on Happiness

True to his philosophy, Epicurus claimed to spend the last few days of life in pleasure, despite all the physical pain he was in. As he writes in his Letter to Idomeneus:
I have written this letter to you on a happy day to me, which is also the last day of my life. For I have been attacked by a painful inability to urinate, and also dysentery, so violent that nothing can be added to the violence of my sufferings. But the cheerfulness of my mind, which comes from the recollection of all my philosophical contemplation, counterbalances all these afflictions. And I beg you to take care of the children of Metrodorus, in a manner worthy of the devotion shown by the young man to me, and to philosophy.

Here we see one of Epicurus' techniques for obtaining happiness even in the most miserable situation: instead of dwelling on the pain, recollect one of those moments in the past when you were most happy. Through enough training of the mind, you will be able to achieve such vividness of imagination that you can relive these experiences and that happiness. This idea is well illustrated by Victor Frankl</, the Viennese psychiatrist who suffered four years in various concentration camps, including Auschwitz. Frankl writes that one of the few things that was able to give him a feeling of happiness was conjuring up an image of his beloved wife, and engaging in imaginary conversation with her. As he writes: \"My mind clung to my wife's image, imagining it with an uncanny acuteness. I heard her answering me, saw her smile, her frank and encouraging look. Real or not, her look was then more luminous than the sun which was beginning to rise.\" (Frankl 1984, p. 57).

Epicurus – Happiness is Pleasure

While we have lost most of Epicurus' treatises on ethics and happiness, his basic ideas are very clearly outlined in his justly famous *Letter to Menoeceus*. He begins with a claim familiar from Plato and **Aristotle**: that we all desire happiness as an end in itself, and all other things are desired as a means for producing happiness. But what is happiness? Epicurus gives a straightforward definition, influenced by Aristippus, a disciple of Socrates and founder of the Cyrenaic school of philosophy:
\"*Pleasure is our first and kindred good. It is the starting point of every choice and of every aversion, and to it we always come back, inasmuch as we make feeling the rule by which to judge of every good thing.*\"
Epicurus then claims that there are two self-imposed beliefs that do the most to make our lives unhappy or full of pain. They are first, the belief that we will be punished by the gods for our bad actions, and second, that death is something to be feared. Both of these beliefs produce fear and anxiety, and are completely unnecessary since they are based on fictions. While the gods do indeed exist, being perfect and eternal they do not

directly concern themselves with human affairs. As such, we have no need to fear any punishment from them, nor do we need to spend time in laborious acts of pious worship. As for death, he points out that once sentient experience comes to an end there will be no sensation of pain. As such, the fear of death is completely groundless. Indeed, he sounds curiously like a Zen master when he writes \"Death is meaningless to the living because they are living, and meaningless to the dead… because they are dead.\"

Epicurus makes an important distinction between necessary and unnecessary desires. Necessary desires are those which are necessary to produce happiness, such as desiring to get rid of bodily pain, or desiring a state of inner tranquility. He writes that \"the end of all our actions is to be free from pain and fear, and once this is obtained the tempest of the soul is quelled.\" Only when we are in pain do we feel the need to seek pleasure, a need which inevitably only produces greater pain. In order to get rid of this pain-pleasure-pain cycle, we need to cultivate a mindset in which there is no pain. Thus the aim is not the positive pursuit of pleasure, as it was for Aristippus. The aim is rather the attaining of a neutral state which is best described as \"peace of mind\" or even \"emptiness,\" to use a Buddhist expression. The Greek word Epicurus uses for this state is *ataraxia*, which literally means \"freedom from worry.\"

Epicurus notes further that we need wisdom to see which pleasures are really pleasurable, and which pains are necessary to produce pleasure. Some pleasures lead to greater pain, like imbibing copious amounts of alcohol, and so the wise person will shun them. On the other hand, certain pains, like sadness, can lead to an appreciation for life or compassion, which are highly pleasurable states. We should not therefore get rid of all negative emotions but only those that lead to unnecessary pains. This, by the way, is also one of the main conclusions that positive psychologist Ed Diener outlines in his latest research on the empirical basis of happiness.

Epicurus – Turning away from the External

Another one of the main conclusions of recent research on happiness concerns the limited role that external conditions play in making one happy. It has been found that income, marriage, good looks, even winning the lottery only have a small impact on one's lasting happiness. Epicurus anticipates this with his claim that the greatest secret to happiness is to be as independent of external things as possible. Being content with the simple things in life ensures that you will never be disappointed. If you put your stock in unnecessary pleasures like costly luxuries and food, you will be 1) upset when you lose these things, 2) anxious to obtain them, and 3) continually pushed onwards towards greater luxuries and hence greater anxiety and disappointment.
In keeping with this sentiment, Epicurus disparages the \"crass hedonism\" which emphasizes physical pleasure, and instead claims that the philosophical pursuit of wisdom with close friends is the greatest of pleasures;
\"*When we say, then, that pleasure is the end and the aim, we do not mean the pleasures of the prodigal or the pleasures of sensuality, as we are understood to do through ignorance, prejudice, or willful misrepresentation. By pleasure we mean the absence of pain in the body and trouble in the soul. It is not an unbroken succession of drinking bouts and of revelry, not sexual lust, not the enjoyment of fish and other delicacies of a luxurious table, that produces a pleasant life. It is rather sober reasoning, searching out the grounds of choice and avoidance, and banishing those beliefs that lead to the tumult of the soul.*\"

Based on this conception of happiness, it is the philosopher who is the happiest of all people, for he chooses the stable pleasures of knowledge over the temporary and volatile pleasures of the body. Epicurus concludes his letter by saying that if one practices these precepts, he will become a \"god among men,\" for he will have achieved an immortal state even whilst in a mortal body. As he writes:
\"Exercise yourself in these precepts day and night both by yourself and with one who is like minded; then never, either in waking or in one's dreams

will you be disturbed, but will live as a god among men. For man loses all semblance of mortality by living in the midst of immortal blessings.\"

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Note the emphasis Epicurus places on practicing the precepts \"with one who is like minded.\" In keeping with Aristotle, Epicurus sees the indispensable value of friendship as a crucial motivator towards one's own true happiness. The problem is that more often than not, other people are a detriment to our happiness, by creating false competition for unnecessary pleasures. The solution to this is to remove oneself from ordinary society and to create a special commune where you interact only with those fellow like-minded pursuers of wisdom. In creating this vision, Epicurus no doubt influenced many Utopian thinkers from More to Marx who pin their hopes of happiness on a complete change in the social relations that form the fabric of who we are as human beings.

Conclusion

Epicurus makes the following claims about human happiness:

- Happiness is Pleasure; all things are to be done for the sake of the pleasant feelings associated with them
- False beliefs produce unnecessary pain; among them, that the gods will punish us and that death is something to be feared
- There are necessary and unnecessary desires. Necessary desires, like desiring to be free from bodily pain, help in producing happiness, whereas unnecessary desires, like desiring a bigger car or a more luxurious meal, typically produce unhappiness
- The aim is not the positive pursuit of pleasure but rather the absence of pain, a neutral state he calls \"ataraxia,\" which is freedom from all worry, often translated simply as \"inner tranquility.\"
- This state of ataraxia can be achieved through philosophical contemplation rather than through pursuit of crass physical pleasures

- Happiness is not a private affair: it can be more readily achieved in a society where like-minded individuals band together to help inspire one another’s pursuit of happiness