The Atomists: Leucippus and Democritus
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Abstract: This chapter investigates the foundations and transmission of ancient atomism, as developed by Leucippus and Democritus, in the broader context of Presocratic thought. Emphasising its fragmentary transmission and the challenges inherent in reconstructing their doctrines, the discussion situates the atomists within ongoing metaphysical debates. First, it explores their innovative response to Parmenides and the Eleatics and the methodological significance of their *ou mallon* principle for reasoning about the nature of reality. Second, by addressing both the philosophical substance and the epistemological dilemmas posed by the distinction between nature and convention, this chapter aims to clarify the atomists' distinctive contributions to the enquiry into the limits of human knowledge, perception, and rational explanation. It concludes that atomism's legacy is a distinctive combination of logical rigor, metaphysical minimalism, and epistemic humility. This framework challenges the boundaries of ancient thought and anticipates concerns that are central to later philosophical debates. The discussion underscores the atomists' enduring significance in the history of philosophy, not only for their naturalist explanations but also for their sophisticated engagement with central questions of ontology and epistemology.

The atomic theory advanced by Leucippus and Democritus marks a watershed in the evolution of Presocratic philosophy, providing an elegant and comprehensive response to central metaphysical problems concerning the nature of reality and truth. While primarily recognised for their doctrine that the universe consists of fundamentally indivisible particles (*atomos*) moving through the void (*kenon*), their philosophical endeavours extend far beyond this materialist physical theory. By positing atoms and void as coequal principles they provided a metaphysical framework capable of salvaging the phenomena of plurality, motion, and change without sacrificing logical coherence. Their atomism simultaneously responds to and develops key aspects of fifth-century debate. At stake in their response is not only the basic architecture of the physical universe, but also the grounds of knowledge.

This chapter begins by introducing the two central figures of ancient atomism, Leucippus and Democritus, and the challenges that arise when working with their philosophical fragments, particularly those that pertain to their ethics. The chapter then situates the core tenets of atomism within the broader debates of ancient metaphysics, focusing on the fundamental metaphysics of atoms and void, and the innovative use of the *ou mallon* principle to establish their ontological parity. Turning next to Democritus' radical re-evaluation of the fifth-century debate concerning the division of nature and convention, I emphasise the epistemic consequences of this distinction for understanding perception, knowledge, and the status of sensory qualities. Throughout, this chapter highlights the innovation embodied in the atomists' thought, revealing how their doctrines straddle polarized intellectual currents, forging a coherent middle path. The discussion culminates in an analysis of how atomism both anticipates and influences later philosophical themes concerning the limits of human knowledge, by framing atomism not merely as an early natural philosophy, but also as a system of thought profoundly aware of its own epistemological limitations.

Leucippus, considered the founder of atomism, remains largely obscure as an historical figure. Even in antiquity details of his life were sparse enough that Epicurus questioned his

existence, although Aristotle confirms him as the founder of atomism.[1] Ancient sources differ in their reports of his place of origin—some associate him with Miletus, a city known for its early natural philosophers like Thales and Anaximander; others link him to Elea, home of Parmenides and the Eleatics; and yet others to Abdera, Democritus' hometown. These conflicting associations likely reflect retrospective attempts to situate Leucippus within established intellectual lineages, perhaps projecting connections to lend authority to differing philosophical strands. His works, including *On Mind* and (perhaps) *The Great World System*, have not survived, and the fragmentary remains of his philosophy are limited mostly to brief testimonies of his doctrines and relatively few verbatim fragments. The quality of these attributions varies which complicates efforts to reconstruct a coherent account of his philosophy. Given such uncertainties, I prefer to attribute only fragments or testimony explicitly naming Leucippus to him and otherwise discuss Democritus or refer to them collectively as the "atomists".

By contrast, Democritus is a well-attested and highly regarded intellectual figure of the fifth century BCE. Although his precise dates are a matter of debate, he is considered to have been active from around the 430s BCE, and is reportedly contemporary with or slightly younger than figures like Anaxagoras and Socrates.[2] His connection to Abdera, a thriving city on the Thracian coast, is well established, and numismatic evidence suggests he held public office there around 414 BCE.[3] Ancient biographers record that Democritus was widely travelled, journeying through Egypt, Persia, and possibly India and Ethiopia.[4] These travels signal his possible access to diverse intellectual traditions, which may be reflected in the breadth of his interests, which encompass not only metaphysics, cosmology, and natural philosophy (including physics, biology, and psychology), but also epistemology, mathematics, ethics, politics, poetry, language, and aesthetics.[5] Ancient sources attribute to him an oeuvre of some sixty-six works, marking him as a prolific writer whose prose style is frequently praised for its clarity and elegance, rivalling that of Plato.[6] Later philosophers such as Aristotle, Epicurus, and the Stoics regarded him as a significant intellectual precursor, engaging directly with his doctrines through written treatises or critical reflections.[7] Despite the fragmentary state of his corpus, what remains reveals a thinker centrally engaged with the dominant philosophical debates of his day, often constructing nuanced positions that offer a middle ground amid polarized views. The contrast between the limited biographical and textual remains of Leucippus' thought and the comparatively rich documentation for Democritus' reflects both historical accident and the intellectual stature these figures attained in subsequent traditions. While Leucippus often functions as a shadowy forerunner, Democritus emerges as a concrete and influential philosopher whose philosophical interests represent a comprehensive worldview.

As is characteristic of Presocratic philosophy, the corpus of Leucippus and Democritus survives only in fragmentary form: through quotations, paraphrases, and second-hand reports preserved in the works of later authors. The extensive attributions to Democritus and to a lesser extent to Leucippus, vary in reliability and contextual framing. Therefore, any serious inquiry into atomist doctrine necessarily becomes an exercise in both philological discrimination and philosophical reconstruction. Fortunately, much of this work has been done for atomist physics, metaphysics, and epistemology, and scholars are making greater headway in establishing the nature and relationship of the ethical fragments.[8] In some cases, we find

sources reliable and accurate within the limited contextual interests they themselves have in excerpting the atomists.[9] In others, we are less certain about the attribution of material, and in late antique handbooks of quotations we find the views of Democritus and Leucippus stripped of all context and listed for their topical relevance to ethical and moral education or rhetorical display.

Particularly vexing are the so-called ethical fragments, many preserved under the name "Democrates."[10] Devoid of any context, these sayings have long given readers an impression of common-sense platitudes, consistent with any number of ancient philosophical positions, which adds to the interpretative challenges. Notwithstanding, scholars have persuasively identified structural consistencies among these fragments that allow us to speak of an atomist ethics, which takes achieving cheerfulness (*euthumia*) as the ultimate goal of human actions and the highest good.[11] This state of the soul involves tranquillity, freedom from fear and excessive passions, and is achieved through moderation, balance, and knowledge. Democritus emphasises the importance of moderation in both prosperity and adversity in addition to cultivating a clear conscience through good actions.[12] As with so many of his contemporaries, Democritus suggests that understanding gained through instruction leads to virtuous behaviour.[13] He taught that virtue involves not only refraining from wrongdoing but even the desire to do wrong, and he illustrates this in relation to political action that serves the public good over private interests.[14] Furthermore, Democritus regarded ignorance as the cause of sin and held that it is better to be wronged than to commit wrong oneself.

These ethical views are conveyed largely through maxims emphasizing reciprocity, prudence in economic matters, self-sufficiency, justice, and altruism, with a stable and moderate soul being essential for well-being. In many respects his themes echo later Socratic moral psychology, and his enlightened hedonism, which values internal states of the soul over external wealth, also bears close resemblance to arguments familiar from the Epicureans, who similarly value pleasure as absence of pain and peace of mind.[15] Aristotle's ethical emphasis on rational moderation and the cultivation of moral character fits well with Democritus' guidance on self-knowledge, moderation, and intellectual reflection, but the extent to which Aristotle's ethics engages with Democritus is a matter of debate. Thematic similarities with later philosophical traditions and the difficulty of engaging in source criticism on the anthologies in which these maxims are preserved, means the ethical and political material is understudied in contemporary scholarship.

In both his ethical and physical fragments, Democritus' method appears to involve careful observation and description of phenomena. In ethics, his concerns tend towards the practical. For example, in describing the best method for achieving peace of mind, he explains how exercises like focusing on one's own advantages in the present and avoiding rumination on the success of others leads to a well-balanced soul.[16] In his political fragments, he often couples the practicalities of public life with general pronouncements about ethical conduct. For example, he explains "When powerful men have the courage to lend money to those who have none, and to help and gratify them, in this then are present compassion, freedom from solitude, companionship, mutual help, consensus among fellow citizens and other good things, so many that no one could enumerate them all."[17] In the physical fragments careful observation of the phenomena underpin his accounts of processes that occur at the atomic level. For example, to explain how void is responsible for growth, Democritus draws an

analogy with filling wineskins with wine and pots of ash with water.[18] And similarly, Theophrastus reports how Democritus explains how something can appear both bright and rough because its shape is like the jetty leading up to the wall of the city.[19] Democritus' explanatory methodology, thus, seeks to integrate an empirical approach to sense experience with rational critique. As we shall see, such empirical rationalism is nonetheless, challenged by his own scepticism about the ground of knowledge.

Atomism and the Eleatic Challenge to the Nature of Being

One of the foundational philosophical inquiries in Presocratic thought concerned the fundamental nature of reality. Diverging from traditional mythological explanations, Presocratic thinkers sought a primary principle—or *archē*—to account for the existence and nature of all things. Early Milesian philosophers, beginning with Thales, proposed various elemental substances as this foundational principle, attempting to explain processes of change and diversity through transformations of a single basic matter. However, this monistic approach soon faced challenges from thinkers proposing dualistic or pluralistic ontologies, such as Xenophanes and Empedocles.

The Eleatic school, led by Parmenides, intervened in this central debate. In the portion of his poem *On Nature* devoted to the Way of Truth, he advanced a radical form of ontological monism.[20] He suggested that our common-sense experiences of change, plurality, and motion are deceptive. True being, he argued, is an eternal, unchanging, indivisible, singular *plenum* – fullness – with no void or non-being. His central dictum, "what-is is and what-is-not is not" logically excludes the possibility of void or empty space.[21] Following this, Zeno and Melissus reinforced Eleatic doctrine through a series of logical paradoxes.[22] By denying the existence of void, Melissus in particular, rejected motion as impossible since motion would require empty space.[23]

These Eleatic insights precipitated a metaphysical and epistemological crisis. If plurality and motion are impossible, how can we account for the rich experiences and changes evident to the senses? In this context, Leucippus and Democritus develop their atomistic theory, not merely as an alternative cosmology, but as a sophisticated response to the Eleatic challenges.[24] They posit two fundamental principles: atoms (what-is), eternal and indivisible units, and void (what-is-not), the empty space through which atoms move. In so doing they provide a coherent account of reality that affirms the Eleatic principles (i.e. the indivisibility, eternity, and fullness of what-is) while radically innovating by asserting the existence of what-is-not, identified as void (*kenon*). Both of these elements are presented as real and essential ontological components of reality.[25] Atomism accepts both the elegant parsimony of Parmenides' metaphysics and seeks to save the phenomena of plurality, motion, and change earlier theories were meant to explain. As a result, the atomists also affirm the radical metaphysical thesis that everything that exists in reality is only atoms and void, the implications of which we will examine below.

In addition to accepting the insights of Eleatic metaphysics, the atomists also make use of a principle of their own, namely the *ou mallon* principle. This principle is a form of indifference argument or symmetry in reasoning between equally plausible alternatives.[26] Literally translated as "no more", it expresses the idea that, absent reasons favouring one alternative, there is "no more" reason to affirm one claim over another. For example, when

confronted with apparent choices, such as whether space is filled or empty, or whether honey is sweet or bitter, Democritus insists *ou mallon*: given his metaphysics, there is "no more" reason for one option to be the case than the other. This simple phrase acquires profound philosophical force as a logical method and as a metaphysical and epistemological foundation for Democritus' insights into the nature of reality.

To see how Democritus uses the *ou mallon* principle in practice, we turn to his masterful assertion that "there is no more (*mē mallon*) reason for the "hing" (**den*) to be than "nothing" (*mēden*).[27] In this passage Democritus is seeking to justify the parity of being between body (atoms) and void. By stripping the negative prefix (*mē*) from "nothing" (*mēden*), Democritus produces a "thing," the artificially constructed, seemingly meaningless, positive term **den* ("hing"), which creates a symmetrical opposition: just as there is thing, so too there is nothing. The linguistic word play of the fragment not only expresses an insight into the nature of reality but is also a *reductio ad absurdum* directed at Melissus' assertion that if "nothing" cannot exist, then only "something" exists. The atomists accept that the Parmenidean what-is exists, which corresponds here to "hing." But the *ou mallon* principle demands that they also accept that what-is-not, i.e. "nothing" exists in a different but equally real sense. In other words, there must be ontological parity between the two. As such, the *ou mallon* argument reveals that, as a matter of logical necessity, the nature of reality is not limited to what-is as the Eleatics thought. Rather, it is, in fact, a combination of what-is and what-is-not. Thus, Democritus uses the *ou mallon* principle to make positive claims about the nature of reality, including the void itself. By contrast, the later sceptical tradition takes up this mode of reasoning to suspend judgement about experiences and beliefs (*dogma*) entirely.

Void, then, for the atomists, is not mere non-existence or absence, but a fully real, causally potent reality that performs various actions in the atomistic framework. As emptiness, it provides the necessary space for atomic plurality and movement, and through those, allows for change. It is characterised as *apeiron* "the limitless" when it is presented as the boundless magnitude in which *cosmoi* form. Finally, Simplicius reports that atoms and void are "equally causes" in the generation of things, where void as "nothing" functions as pockets or gaps of absolute emptiness.[28] Its only characteristic is to "give way" when atoms move, whether that movement occurs in the cosmos, in objects, or in our own bodies.

Atomos means "uncuttable", and Democritus' argument for atomic indivisibility rests not on the minuteness, but on the fullness or internal solidity of atoms, which renders them resistant to division and persistent through change.[29] This reasoning is reinforced not only by the acceptance of Eleatic homogeneity, but also by his reasoning about physical division, preserved in an account of the cone paradox.

> Democritus … vividly raised this physical puzzle: if a cone were cut along a plane parallel to its base, what should we hold the surfaces of the segments to be, equal or unequal? For if they are unequal they will make the cone uneven, with many step-like indentations and rough edges. But if they are equal, the segments will be equal and the cone will turn out to have the properties of a cylinder, through consisting of equal, not unequal, circles, which is quite absurd."[30]

The cone paradox reveals the incoherence of attempting to divide perfectly solid forms, although it might easily be dismissed as a mathematical puzzle solvable by a geometer who can show that the cut faces of a cone divided parallel to its base would share a plane. Sedley argues that the issue is metaphysical.[31] Unlike the geometer's abstract cone, a division parallel to the base of a genuinely physical, homogeneous cone, results in two new cut surfaces which cannot coincide within the same plane. Thus, every attempted cut of a solid cone parallel to its base produces the paradoxical conditions described, rendering the cone effectively indivisible in that direction.

Democritus, here too, may invoke the *ou mallon* principle: if a solid cone is not divisible parallel to its base, there is "no more" reason for it to be divisible anywhere else. The same reasoning extends to spheres, pyramids, and irregular bodies: any genuinely solid figure, resisting subdivision equally throughout, must be an uncuttable fundamental unit. Such bodies cannot be divided further and so constitute the smallest "real" magnitudes, regardless of size. In defending this ultimate indivisibility, Democritus secures the Eleatic attributes of atoms, but he departs from them by arguing that what-is exists as many atoms infinite in number, size, and shape. At the heart of this claim, too, lies the *ou mallon* principle, which insists there is "no more" reason for atoms to possess one size or shape rather than another or to be one in number rather than infinite. As in the case of void, here too, Democritus uses this principle to reject arbitrary distinctions and uphold symmetry. Epicurus abandons the infinite variety of atoms (but not their infinite number) due to concerns about the limits of natural properties and the imperceptibility of atoms.[32]

For the atomists, the combinations formed when atoms of various shapes and sizes come together in the void are responsible for the objects and qualities of our experience. Aristotle reports Democritus' dynamic technical terms for describing these differences in rhythm, (*rusmos*), touching (*diathēgē*), and turning (*tropē*), illustrating them respectively as differences in shape (*schema*) as A differs from N, alignment (*taxis*) as AN differs from NA, and in position (*thesis*) as I differs from H.[33] Although these examples are likely Democritus' own, Aristotle's gloss of the terms places greater emphasis on static atomic arrangements, shifting focus away from atomism's dynamic interactions.[34] Democritus' use of *rusmos*, or 'rhythm,' marks not only a shape but also a shape-driven capacity: spherical atoms roll, cubes resist movement, and cones or pyramids spin, slide, or tumble. Like atoms themselves, these kinetic capacities persist through change. In contrast, the alignment ('touching') and position ('turning') of atoms are relational qualities that depend on combination and reorganization. These transient microstructures—what Democritus called "entanglements" or "interlacings" (*periplokē*)—arise from the ongoing, dynamic interplay of eternally existing atoms in the void and are responsible for the world of experience.[35]

The various combinations that result from the plurality of atoms moving through the void allows the atomists to "save the appearances," as Aristotle suggests was their aim.[36] Every colour we see, every object we hold, every person we meet, every cosmos that is formed is the result of these basic forms of atomic interaction in the void. But such an account raises complex questions of its own. What is the ontological status of such atomic arrangements? If atoms and void are not available to direct perception, how can we know them? Is there a legitimate cognitive role for sensible qualities like sweetness and warmth, even if they do not exist "in reality"? In the next section, we will examine these questions in light of the radical

atomist transformation of the key fifth-century debate about the relation between nature and convention.

Atomism and the Nature-Convention Dichotomy

The antithesis of nature (*physis*) and convention (*nomos*) is a central theme of fifth-century BCE debate.[37] Although sharply polarized by the Sophists as a debate between the necessary order of the *cosmos* and the constructed, contingent order of human society, earlier Presocratics, like Anaximander and Heraclitus, tend to see a unity between the two, suggesting that laws express deeper natural or cosmic principles.[38] In the hands of Sophists like Antiphon, Hippias, and Thrasymachus, *nomos* and *phusis* become antagonists. Conventions and laws constrain the natural advantages and necessities of our shared human nature for political ends.[39] For others, like Protagoras and the author of the *Anonymous Iamblichi*, *nomos* is necessary for the development of society and is itself a human response to the needs and weaknesses inherent in our nature.[40]

Democritus radically alters the parameters of the nature-convention debate by moving it out of the realm of social customs and political ethics and into the realm of metaphysics. In what may be his most famous fragment, he shifts the term for nature, *physis,* to his own term meaning "in reality" or "truly" (*eteē*):[41]

> By convention (*nomō*) sweet and by convention bitter, by convention hot, by convention cold, by convention colour; but in reality (*eteē*), atoms and void.

Preserved in four ancient sources, this fragment suggests that "reality" or "truth" (*eteos*) is grounded in the unchanging natural principles of atoms and void, while the sensible qualities are mere constructs arising from atomic interactions. This claim radically downgrades the ontological status of those things that are "by convention," namely the sensible qualities. At the same time, it also raises foundational epistemic questions about the reliability of human perception, the status of sensory knowledge, and how we access truth.

All sources for the *nomō-eteē* fragment highlight the significance of Democritus' ontological claim. Although qualities such as sweetness, warmth, and colour do not exist "in reality," they are not conventional because they are arbitrary, but because they result from our interactions with atomic arrangements and motions invisible to the senses. Surviving reports of Democritus' sensory qualities, notably from Theophrastus' *de Sensibus*, bear this out. For example, in the case of the sharp or acrid taste, he attributes the sensory experience to distinctive atomic shapes (e.g. angular jagged, thin) their motion (slipping swiftly everywhere), and their capacity to bring about changes both in the perceiver (e.g. contracting, puckering, heating) and the microstructure itself (by producing void within).[42] Other times, it is the atomic structure and the aggregate arrangement of shapes that determine the tactile and visual qualities of an object, such as its brightness and smoothness.[43] Ancient commentators regularly equate perceptible qualities or entities like the soul with atomic shape alone, but Democritus stressed that it is really the aggregate effect of its shape, motion, arrangement and position that matters, with void playing a direct causal role.[44]

Democritus also recognized the variability of perception, noting that the prevailing type and condition of atoms in an object, as well as the constitution of the perceiver, can alter sensory experience. For example, eye conditions can dull the sensation (*aisthēsis*) and potency (*dunamis*) of a colour, and illness can make honey taste bitter rather than sweet.[45] Such

differences occur not just within a single perceiver, or within humans, but in non-human animals as well. These points highlight Democritus' attention to individual and species variation and the influence of constitution on experience.

What then are we to make of these reports considering the ontological claims that make sensibles conventional and only atoms and void real? Scholars debate whether Democritus is best understood as a reductionist who explains colour and other qualities by reducing them to atomic microstructures or as an eliminativist who claims that only atoms and the void are real and sensory qualities do not exist at all.[46] On the reductionist view, the atomic microstructure that predominates in a body causally or explanatorily grounds the sensible property. In other words, sensible qualities do exist but only as phenomena ultimately explainable in terms of atomic structure and dynamics. On this interpretation, the phrase "by convention" signals how appearances arise from underlying processes and does not introduce a new ontological category. But Sedley convincingly argues that Democritus' reductionism leads him to exclude the sensibles from his ontology.[47] On this eliminativist interpretation, declaring qualities like sweetness, warmth, or colour conventional denies their reality; they are entirely constructions of perception or convention. It is because the sensibles cannot be identified with physical states that they are unreal.[48] In other words, Democritus is an anti-realist about sensible qualities. Plutarch, following Theophrastus' critique, takes the eliminativist reading further by suggesting Democritus adds "combination" (*sugkrisis*) to the conventional side of this distinction.[49] On this account, Democritus eliminates not only sensible qualities but all things formed through combination from his ontology. Wardy and Purinton argue that this arises from Democritus' commitment to logic of Parmenides and Melissus, who deny the reality of anything composite and changeable, and macroscopic combinations are both.[50] We have already seen Democritus' fruitful engagement with Eleaticism, but the evidence in Plutarch is uncorroborated and occurs in a polemical context in which the speaker is trying to make life unliveable. We need not go so far as to equate Plutarch's interpretation with Democritus' own view. Furley also see Democritus' Eleaticism at work here, arguing it is in direct response to Melissus that Democritus asserts that the changeability of sensation is the reason they are unreal.[51] O'Keefe, by contrast, argues that it is Democritus commitment to the *ou mallon* principle that leads him to claim the senses are unreal.[52] If honey is no more sweet than bitter, then it is neither, in reality. Thus, we see that Democritus' deep engagement with Eleaticism and his reliance on the *ou mallon* argument also informs his approach to the ontological concerns of the convention-reality distinction.

The *nomō-eteē* fragment suggests that the senses are an unreliable guide to what is real. But the reason for it varies in our sources. Sometimes, it is due to the changeability of perception, sometimes to its relativity, and at other times it arises from the limits of human physiology. In his *Kratunteria*, a work seemingly devoted to the conflict between intellect and the senses, Democritus asserts

> We in reality have no reliable (*atrekēs*) understanding, but one which changes in accordance with the condition (*diathēkē*) of the body and of the things which penetrate and collide with us.[53]

Here, the intra-subjective changeability both of our sensible faculties and of an object's sensible qualities makes sensation unreliable. In other words, we cannot rely on our senses

because although honey tastes sweet when I am well or when mixed with almonds, when I am ill or it is mixed with vinegar, honey tastes bitter. By arguing that changeability is the reason the senses are unreliable, Democritus makes the conditions of perception matter for our understanding. Moreover, it suggests that the force of the Eleatic injunction against change lurks in the background of his epistemology.

The Peripatetic testimony, by contrast, frames Democritus' questions about how reliable the senses are in terms of his commitment to the *ou mallon* principle. Aristotle reports that

> Which kinds of these [i.e. sensations] are true or false is unclear. For these are not more true than those, but similarly so. And that is why, as for Democritus, he says that nothing is true or else that it is not clear, at least for us.[54]

On this view, either all our sensory experiences are illusory or some of our experiences are true, but even if the latter is the case, we have no basis for determining that this is so. Because I judge differently at different times, or we disagree about the flavour of the honey in the moment, we have no firm sense of whether honey is sweet or bitter. We cannot decide on the truth-value of sensation and must conclude that honey is no more sweet than bitter. Although this formulation is a mainstay for later sceptics, Democritus is not himself a sceptic. Even though he concludes that what appears "is not clear for us," he does not suspend judgement on the existence of atoms and void but dogmatically asserts that these fundamental principles exist and that "truth is in the depths." In the Hellenistic period, the Pyrrhonian sceptics, Sextus Empiricus among them, draw explicitly on features of Democritus' reasoning and make ubiquitous use of the *ou mallon* principle. But whereas Democritus holds a form of negative dogmatism when he suggests "honey is neither sweet nor bitter," the Pyrrhonists default position is to suspend judgement in all matters beyond appearances.[55]

A third piece of evidence, suggests that Democritus explains the persistent gap between human perception and true reality as a problem that arises from our nature as human beings. Near the end of a long passage that opens with the *nomō-eteē* fragment, Sextus presents this "verbatim" (*kata lexin*) quotation from Democritus:

> "Of knowing (*gnōmē*) there are two forms, the one genuine, the other bastard. And of the bastard kind this is the complete list: sight, hearing, smell, taste, touch. The one which is genuine, but separate from this one, is when the bastard one is no longer able either to see in the direction of greater smallness, nor to hear or smell or taste or sense by touch other things in the direction of greater fineness." Therefore, according to Democritus, too, reason is the criterion: he calls it "genuine knowing".[56]

The distinction between genuine and bastard knowledge emphasises the limits of human perceptual thresholds. Focusing for the moment on the "bastard" senses, this quotation suggests that it is not the changeability or relativity of the senses that undermine their reliability. Rather, it is merely a brute fact about the nature of human physiology that we reach a point where we can neither see "greater smallness" nor perceive "greater fineness" in other sensory domains. This claim brings Democritus closer to the Sophistic use of the *nomos-phusis* distinction with which we began this section. It suggests that by calling sensory qualities "conventional," he grounds them in common human biology and in language.[57] Although such qualities do not exist "in reality," they are, nevertheless,

intersubjectively stable because we have an agreed way of referring to them. As Theophrastus puts it:

> Even if the sweet and the bitter do not arise for all by the same means, nevertheless the nature of bitter and sweet appears the same to all. And he would himself appear to bear witness to this. For how could what is bitter for us to another be sweet or astringent, if there were not some definite nature of them? He also makes it more clear in those cases where he says that each one comes to be in reality, but that individually we have a small share of understanding.[58]

This individual "small share of understanding" may be related to Democritus' assertion that "human (*anthrōpos*) is what we all know."[59] The singular *anthrōpos* may suggests that each person's knowledge is their own singular human experience. But even if that is the case, "we all" also share certain physiological and psychological traits common to all humans. Thus, "man" denotes both what each of us know individually, and, because of our shared human nature, "what we all know" collectively. The broader communal dimension of our knowledge arises in part from our species membership, but our shared communal life – language, customs, norms – also enables a conventional, shared understanding of "man."[60] On this view, "bastard" sensory knowledge just is knowledge that arises from shared conventional insights. It is not concerned to offer direct metaphysical access "in reality". In other words, the senses reflect species-wide experiences, not metaphysical absolutes. This anticipates later concerns with the relativity of knowledge found in Plato and Aristotle, most famously associated with their treatment of Protagoras' "man is the measure" dictum.[61]

At this stage, we can now return to Democritus' further assertion that "genuine knowing," is "separate" from bastard knowledge, and intervenes when perception reaches its limits. This suggests that Democritus sees a role for rational inference in accessing "truth that is in the depths."[62] Sedley argues that this form of knowledge alone is presented in Sextus Empiricus as a means of acquiring knowledge for the atomists, whereas Lee argues that Democritus posits two criteria: that which arises via the senses and that gained by reasoning about reality, grounded in experience.[63] On her view, the mind relies on the senses as a source of knowledge with which reason formulates its own explanations of reality.

The individual's dependence on reason to provide a clearer understanding, however, poses its own tension: the intellect must start from sensory appearances, and if those are deceptive, how does reasoning get started? Democritus himself grapples with this distinctive form of scepticism in relation to his *nomō-eteē* claim. For immediately after citing it, Galen quotes one of the earliest instances of philosophical dialogue in which Democritus personifies the sense-based "bastard" (*nothos*) knowledge as protesting to "legitimate" (*gnesios*) knowledge:

> "Poor mind, you get your evidence from us, then you demolish us. Our fall is your demolition."[64]

By denying the authority of the senses, reason undermines itself. This leaves the atomists in the unenviable position of having devised a philosophical system to "save the appearances" from the Eleatic challenge which they then undercut by limiting reality to atoms and void. And yet, if we return to the limits Democritus places on the "bastard" senses, we might find

space for optimism, for humans have found ways – through education, empirical investigation, and technological advancement – to see in the direction of greater smallness and greater fineness. Democritus' own empirical methods set a good example:

[. . .] When he was eating a cucumber its flavor seemed to him to taste like honey, so he asked his serving woman where she had bought it. When she indicated a certain garden, he got up and told her to lead him and to show him the place. The woman was surprised and asked him what he wanted, and he said, "I have to discover the cause of the sweetness, and I shall discover it by observing the place." "Then you can sit down," the woman said with a smile ,"for without noticing it I put the cucumber into a container that had been filled with honey." But he replied in irritation, "You have tried to fool me, and I shall stick nonetheless to what I said and I shall look for the cause."[65]

Democritus holds that knowledge and understanding of the world may be provisional, but he is nonetheless committed to the discovery of a "single causal explanation" (*aetiologia*).[66] Atomism thus anticipates the philosophical theme of epistemic humility: the recognition that truth may be incommensurable with our experience.

In sum, Democritus' account of perception exposes the gap between appearance and reality: sensible qualities belong "by convention," not "in truth," illuminating the changeability, relativity, and limits inherent to human experience. This provocative move generates a distinctive epistemological stance which compels Democritus to reflect on the nature of knowledge and the status of sense perception. The epistemic concern is whether appearances have any cognitive weight at all. The answer, for Democritus, seems to be yes and no. There is no inconsistency in holding both that the senses command evidence about the world and that they are unreliable sources of certain knowledge. In so far as they tells us something "conventional" about our human experience, the sense faculties have cognitive weight, but insofar as they provide us access to the fundamental nature of reality, sensation and the reason that arises from it falls short. The *nomō-eteē* division thus presents a series of intertwined epistemological problems that stem directly from its ontological implications, which expose a fundamental tension between sense-experience, reason, and the nature of reality.

Conclusion

The reconstructed atomist doctrines of Leucippus and Democritus offer a radical alternative to the monism and static ontology of the Eleatic school. By positing indivisible atoms and the void as the fundamental constituents of reality, these early thinkers provide a systematic explanation for plurality, motion, and change, while simultaneously confronting the paradoxes of sense perception, knowledge, and convention. Through their innovative use of the *ou mallon* principle they establish a framework for understanding both the physical and epistemological dimensions of the cosmos, making pioneering contributions that resonate throughout the Western philosophical tradition.

Despite the obscurities in textual transmission, their philosophy emerges as a powerful synthesis of logical rigor and metaphysical subtlety. The tension between appearance and reality, and the demotion of sensory qualities to the status of mere conventions, foreshadows later sceptical traditions and sets new standards for philosophical argumentation. Atomism's

enduring legacy is the recognition of the limitations inherent in human knowledge and perception, reflecting an epistemic humility that continues to inform debates across philosophy and science. Through their intellectual rigor and bold metaphysical innovations, Leucippus and Democritus provided subsequent generations with sophisticated tools for questioning the nature of reality.

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[1] Diogenes Laertius, *Lives of the Eminent Philosophers* 10.13 = LM27 R80 = DK 67 A2. Aristotle, *Metaphysics* 985b4-22 = LM27 D31 = DK 67 A6, Aristotle, *Generation and Corruption* 314a11-25 = LM27 D30 = DK 67 A7.
[2] See LM27 P9-P15. For discussion, see Davison (1953) and O'Brien (1994) 649–75.
[3] Procopé (1989) and Cartledge (1999) 4.
[4] Diogenes Laertius, *Lives of the Eminent Philosophers* 9.34-45 = DK 68 A1. In LM27 see P16-P22, P38, D354 = DK 68 B247. For a fictionalised account of Democritus' travels, see Gore Vidal's *Creation*.
[5] Se the detailed table of contents for LM 27 (p. 6-15) and the Thrasyllan catalogue (Diogenes Laertius, *Lives of the Eminent Philosophers* 9.45-49 = DK 68 A33, also in LM27 P42 and the subsequent list of works D1-D13).
[6] See LM27 P29-30, P34, P37a-P39, P42-45 on Democritus' preeminence. On his style, see LM27 R5-R9. Plato never names Democritus directly but engages with atomist ideas in *Sophist* and *Timaeus*; Diogenes Laertius (LM27 R11) records that Plato wanted Democritus' books burned but the Pythagoreans warned him they were already too widely known.
[7] On later philosophical works dedicated to Democritus, see LM27 R1-2.
[8] See Vlastos (1945), (1946), Natorp (1970), Kahn (1985), Procopé (1989), Cartledge (1999), Annas (2002), Warren (2002), Mejer (2004), Johnson (2014), Laks (2017), Peixoto (2017).
[9] Rudolph (2018), Baltussen (2000), Long (1996), Morel (1996).
[10] Nearly 300 fragments are preserved under the name Democrates, see Warren (2002) 30-32 and Voros (1973) on their authenticity.
[11] Diogenes Laertius 9.45 = LM27 D229 = DK 68 A1; Cicero, *On Ends* 5.29.87 = LM27 D230 = DK 68 A169; Stobaeus, *Anthology* 2.7.3i = LM27 D231 = DK 68 A167.
[12] Stobaeus, *Anthology* 4.44.68 (attributed to Democrates, *Sent*. 8) = LM27 D300 = DK 68 B42; Stobaeus, *Anthology* 4.4.69 (attributed to Democrates, *Sent*. 12) = LM27 D327 = DK 68 B46; Stobaeus, *Anthology* 3.3.46 = LM27 D243 = DK 68 B194; Stobaeus, *Anthology* 2.15.36 = LM27 D340 = DK 68 B55; Stobaeus, *Anthology* (attributed to Democrates, *Sent.* 7) = LM27 D387 = DK 68 B41.
[13] Stobaeus, *Anthology* 3.16.19 = LM27 D333 = DK 68 B229, Stobaeus, *Anthology* 2.31.65 = LM 27 D403 = DK 68 B33.
[14] Stobaeus, *Anthology* 3.7.25 = LM27 D 323 = DK 68 B263, Stobaeus, *Anthology* 4.1.43 = LM27 D356 = DK 68 B252.
[15] See Warren (2002).
[16] Stobaeus, *Anthology* 3.1.210 = LM27 D226 = DK 68 B191.
[17] Stobaeus, *Anthology* 4.1.46 = LM27 D364 = DK 68 B255.
[18] Aristotle, *Physics* 213a31-b22 = LM27 D39 (part) = DK 67 A19. See Lloyd (1966).
[19] Theophrastus, *de Sensibus* 79.7-13 = portion of DK 68 A135. See Rudolph (2019).
[20] For the classic discussion of Parmenides presenting a *reductio* of Milesian material monism, see Guthrie (1965). Against this view, see Barnes (1979). Parmenides, in the Way of Mortals, also presents a dualist metaphysics, on which see LM19 D12 = DK 28 B8.54ff., LM19 D13 = DK 28 B9, LM19 D14 = DK 28 B12.
[21] Parmenides LM19 D6 = DK 28 B2.
[22] See Sedley (1999) and Hasper (2006) on the atomist response to Melissus and Zeno.
[23] LM21 D10 = DK 30 B7 and LM21 D8 = DK 30 B9.
[24] See Sedley (2008) or for an alternative view Osborne (2004).
[25] Aristotle, *On Generation and Corruption* 325a23–32 = LM27 D30 = DK 67 A7 (part).
[26] See Makin (1993), Gregory (2013). Schofield (2002) argues that *ou mallon* originated with Democritus rather than Leucippus.
[27] Plutarch, *Against Colotes* 4.1109A = LM27 D33 = DK 68 B156 (part). Cf. Aristotle, *Metaphysics* 985b7-9 = LM27 D31 (part) = DK 67 A6 (part) and Simplicius *Commentary on de Caelo* 294.33-295.22 (Arist. *Dem*. Frag. 208 Rose) = LM27 D29 = DK 68 A37.
[28] Simplicius, *Commentary on Aristotle's* Physics 28.4-27 = LM27 D32 = DK 67 A8/ DK 68 A38). See also Cicero, *Prior Academics* 2.36.118 = LM27 D11 = DK 67 A8. Themistius, *Commentary on Aristotle's* Physics 123.18-10 = Luria 268 = Taylor (1999) 44c = not in LM, not in DK and 129.8-9 = Luria 269 = Taylor (1999) 44d = not in LM, not in DK. On void, see Furley (1976), Sedley (1982), and Taylor (1999) 80-82, 184-88.

[29] Aristotle comments at length on atomic properties in his *Physics*, *On the Heavens* and most notably, in *Generation and Corruption* 314a11-25, 315a34-b15, 315b28-317a17, 316a13-b34 (on the Eleatics), and 324b25-326b6, where he addresses the atomic properties and their relation to Eleatic principles. See also, Epicurus, *Letter to Herodotus* 40-41 and 58-59. The atomist arguments in *GC* have been well-treated by Sedley (2004). See also Furley (1967) 57–103, Makin (1993) 49-62, Bodnár (1998), Taylor (1999) 160-175, Hasper (1999), (2014) 65-68, and Betegh (2006): 266–68.
[30] Plutarch, *On Common Conceptions* 1079E = LM27 D213 = DK 68 B155 (part). See Sedley (2008), cf. Vlastos (1965), Hahm (1972), Taylor (1999) 199-20.
[31] Sedley (2008).
[32] Epicurus, *Letter to Herodotus* 55-56.
[33] Aristotle, *Metaphysics* 985b10–19 = LM27 D31 = DK 67 A6.
[34] See Mourelatos (2005). Gomes (2019) argues *rusmos* is a feature at the microstructural level. See McDiarmid (1958) on the vibratory motion of atoms.
[35] Simplicius, *Commentary on* De Caelo 294.33-295.36 = Aristotle, *On Democritus* Frg. 208 Rose = LM27 D29 = DK 68 A37.
[36] Aristotle, *On Generation and Corruption* 315b6-15 = LM27 D56 = DK 67 A9 and 324b35-325b5 = LM27 D30 = DK 67 A7. Cf. Sextus Empiricus, *Against the Mathematicians* 7.369 = LM27 R98 = DK 68 A110 and Galen, *On Medical Experience* 15.7.5, Frag. Graec. 1259.10-14 Schöne 1901 = LM27 D23a = DK 68 B125.
[37] See Taylor (2007).
[38] Simplicius, *Commentary on Aristotle's* Physics 24.13-25 = Theophrastus, Frag. 226a FHS&G = LM6 D6 = DK 12 B1 and Stobaeus, *Anthology* 3.1.179 = LM9 D105 = DK 22 B114.
[39] See Antiphon, Oxyrhynchus papyri 1364. Frg. 1 = LM37 D38a = DK 87 B44a as well as the arguments of Hippias (Plato, *Protagoras*, 337c-338b = LM36 D17, Xenophon, *Memorabilia* 4.4.13-14 = LM36 D61a-b), Thrasymachus (Dionysus of Halicarnassus, *Demosthenes* 3 = LM35 D16 = DK 85 B1, Plato, *Republic* 1.338c, 339b, 343c-d). See also, assigned to Critias, the fragment of *Sisyphus* 43F 19 Snell = LM42 T63 = DK 88 B25.
[40] Protagoras sees *nomos* arising conventionally from human cooperation (Plato, *Protagoras* 320c-322d = LM31 D40 = DK 80 C1). The *Anonymus Iamblichi* (97.25–98.11, 100.5-101.6, 101.17–102.24, 102.26–104.17), by contrast, emphasizes how *nomos* is a natural cooperative feature of human beings. Compare the formation of human society attributed to Democritus, preserved in Diodorus Siculus 1.8.1-9 = LM27 D202 = DK 6*8* B5.
[41] DK 68 B9, B125. Preserved in Sextus Empiricus, *Against the Mathematicians* 7.135 = LM27 D14, R108, Galen, *On Medical Experience* 15.7 = LM27 D23a, Galen, *On the Elements according to Hippocrates* 1.2 = LM27 D23b, and Diogenes Laertius, *Lives of the Eminent Philosophers* 9.72. Cf. Theophrastus *de Sensibus* 63-64, 68-69.
[42] Theophrastus *de Sensibus* 65.1-4.
[43] Theophrastus *de Sensibus* 73.
[44] On Democritean psychology see Carter (2019) 79-102 and Augustin and Pello (2022).
[45] On the environmental and physiological factors influencing Democritus' theory of vision, see Rudolph (2011) and (2012). For discussion see of variability see Ganson (1999), O'Keefe (2009) 33-40, 87-96 and Rudolph (2017).
[46] Ganson (1999), Lee (2005). Aristotle suggests Democritus is a reductionist at DK 68A126, *On Generation of Animals* 789b2-4, and *Physics* 252a32-35.
[47] Sedley (1988) 298-299.
[48] O'Keefe (1997) 123-124.
[49] Plutarch, *Against Colotes* 1110E-F. Cf. Theophrastus, *de Sensibus* 60, 63-64, 70 and *de Causis Plantarum* 6.2.1-6.2.2. See also Sextus Empiricus, *Against the Mathematicians* 8.184.
[50] Wardy (1988) and Purinton (1991). Against this view see O'Keefe (1997)
[51] Furley (1993) 93. Melissus LM21 D11 = DK 30 B8.
[52] O'Keefe (1997) 124-126.
[53] Translation Sedley (1992) modified. See the entire passage in Sextus Empiricus, *Against the Mathematicians* 7.135-140, where he cites four further passages in which Democritus raises concerns with our distance from reality. On the *Kratunteria*, cf. Diogenes Laertius, *Lives of the Eminent Philosophers* 9.45.
[54] Aristotle, Metaphysics 1009b9-12 = LM27 R52 = DK 68 A112. LM translation, modified. Cf. Theophrastus, *de Sensibus* 69.11: "no one obtains truth more than any other." See Morel (1996, 244–256) and Gregory (2013).
[55] Sextus Empiricus, *Outlines of Pyrrhonism* 1.213–14 = LM27 R106 = not in DK.
[56] Sextus Empiricus, *Against the Mathematicians* 7.139 = LM27 D20-D21 = DK 68 B11. Translation, Sedley (1992).
[57] See Pierogiacomi (2017) 439.
[58] Theophrastus, *de Sensibus* 70.6-71.1.
[59] Sextus Empiricus, *Against the Mathematicians* 7.265, Cicero, *Prior Academics* 2.23.73 = LM27 D26b = DK 68 B165. On Democritus and Protagoras see Lee (2005).

[60] See Democritus' anthropology in Diodorus Siculus 1.8.1-9 = LM27 D202 = DK 68 B5.
[61] "Of all things the measure is man: of those that are, that they are; and of those that are not, that they are not" in Sextus Empiricus, *Against the Mathematicians* 7.60 = LM31 D9 = DK 80 B1. Cf. Plato, *Theaetetus* 161c, 166d-167d.
[62] Diogenes Laertius 9.72 = LM27 D24 = DK 68 B117.
[63] Sedley (1992). Lee (2005) 247. See also Taylor (1999).
[64] Galen, *On Medical Experience* 15.7.5 = Frag. Grace. 1259.10-14 Schöne 1901 LM27 D23a = DK 68B125, translation Sedley (1992). Cf. Diogenes Laertius 9.72 = LM27 D24 = DK 68 B117, Sextus Empiricus, *Against the Mathematicians* 7.139 = LM27 D20-21 = DK 68 B11.
[65] Plutarch, *Table Talk* 1.10 628C–D = LM72 P41 = DK 68 A17a. LM translation.
[66] Eusebius, *Evangelical Preparation* 14.27.4 = LM27 P40 = DK 68 B118.

Other Chapters to Consult

Sources for Presocratic Philosophy, Parmenides, Melissus, Zeno, Empedocles, Anaxagoras, Protagoras and Gorgias, Theories of Nature, Hellenistic Philosophy

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