The Size Of Atoms (And Their Differences)

Post by “Cassius” of March 26, 2026 at 7:02 AM

Among the topics we discussed in a zoom last night was what does Epicurus say about atomic size whether there a finite range of atomic sizes? The following is AI so take it only as a possible starting point.

Atomic Size (μέγεθος) in the *Letter to Herodotus*

What Epicurus Actually Says (§§55–56, 58–59)

Epicurus establishes two constraints on atomic size that work in opposite directions, producing a **finite range**:

Lower bound — atoms are not infinitely small: Atoms cannot be arbitrarily tiny because they must be composed of a minimum number of **minimal parts** (ἐλάχιστα). The atom is the *smallest composite* body — it has parts that are conceptually distinguishable as minima, even though those parts cannot exist independently. This is the famous **theory of minimal parts**, developed in part to answer Zeno's paradoxes of infinite divisibility. An atom of one minimum part would be a mathematical point, not a physical body.

Upper bound — atoms are not perceptible: Epicurus states explicitly that **no atom is ever large enough to be seen** (§55). If atoms were perceptible in size, we would observe them. We do not. Therefore their sizes must fall entirely below the threshold of perception.

The relevant sentence from §55 (paraphrased): atoms have size, shape, and weight, but *no quality that perception can grasp* — they cannot be seen, tasted, or touched as individual atoms.

Why a *Finite* Range of Sizes?

The argument runs something like this:

1. Atoms differ in size (this is required to explain why compounds differ — identical atoms could not produce variety).
2. But the variation is bounded: there is a **smallest possible atom** (a body with the fewest possible minimal parts, probably one or two) and a **largest possible atom** (still sub-perceptible).
3. Therefore the range of atomic sizes is **finite in number of types**, even if the number of *individual* atoms within each size-type is infinite.

Epicurus makes this explicit: the varieties of atomic shapes are **not infinite in number**, only *incomprehensibly large* (§42). The same logic applies to sizes. An actual infinity of size-types would create serious problems — it would allow for atoms large enough to be perceptible, which contradicts the evidence of experience.

Sedley's Analysis

Sedley (*Lucretius and the Transformation of Greek Wisdom*, 1998, and "Epicurean Anti-Reductionism," 1988) emphasizes that the minimal parts doctrine is **Epicurus' own innovation**, not found in Democritus. For Democritus, atoms could in principle be any size — Epicurus constrains this by grounding atomic structure in a discrete geometry of minima. This gives the size property a **quasi-mathematical character**: atomic size is not a continuous variable but a discrete one (how many minima make up this atom?).

This is philosophically significant because it means μέγεθος, unlike the emergent qualities of compounds, is **intrinsic, immutable, and countable** — which is precisely why it qualifies as a genuine *property* of atoms rather than a *quality* in the coniuncta/eventa sense.

Lucretius' Parallel Account

Lucretius covers this in **DRN 1.599–634** (the finitude of atomic shapes) and implicitly throughout Book 2 (2.333–380 on size variation explaining sensory differences). He does not invoke the minimal parts argument as explicitly as Epicurus does, but the upper bound — atoms are always invisible — is stated clearly and used to explain why the world appears continuous even though it is granular.

Summary Table

Constraint	Direction	Reason
Minimal parts (ἐλάχιστα)	**Lower bound** on size	Atoms cannot be mathematical points; they must have physical extension
Sub-perceptibility	**Upper bound** on size	If atoms were visible, we would see them; we do not
Result	**Finite range** of size-types	Prevents both infinite smallness and perceptible largeness

The elegance of Epicurus' position is that both constraints are *empirically motivated*: one by the fact that matter is physically real (not geometric abstraction), the other by the fact that atoms are never observed directly. The finite range of μέγεθος is thus not a mathematical stipulation but a conclusion drawn from two independent observations about the nature of physical reality.