Episode One Hundred Nineteen - Letter to Herodotus 08 - More On Perception Through The Atoms

Post by “Cassius” of April 21, 2022 at 5:18 PM

Welcome to Episode One Hundred Nineteen of Lucretius Today.

This is a podcast dedicated to the poet Lucretius, who wrote "On The Nature of Things," the only complete presentation of Epicurean philosophy left to us from the ancient world.

I am your host Cassius, and together with our panelists from the EpicureanFriends.com forum, we'll walk you through the ancient Epicurean texts, and we'll discuss how Epicurean philosophy can apply to you today. We encourage you to study Epicurus for yourself, and we suggest the best place to start is the book "Epicurus and His Philosophy" by Canadian professor Norman DeWitt.

If you find the Epicurean worldview attractive, we invite you to join us in the study of Epicurus at EpicureanFriends.com, where you will find a discussion thread for each of our podcast episodes and many other topics.

Today we continue our review of Epicurus' letter to Herodotus, and we move further into fundamental physics.

Now let's join Martin reading today's text:

Bailey

Moreover, hearing, too, results when a current is carried off from the object speaking or sounding or making a noise, or causing in any other way a sensation of hearing. Now this current is split up into particles, each like the whole, which at the same time preserve a correspondence of qualities with one another and a unity of character which stretches right back to the object which emitted the sound: this unity it is which in most cases produces comprehension in the recipient, or, if not, merely makes manifest the presence of the external object.

[53] For without the transference from the object of some correspondence of qualities, comprehension of this nature could not result. We must not then suppose that the actual air is molded into shape by the voice which is emitted or by other similar sounds — for it will be very far from being so acted upon by it — but that the blow which takes place inside us, when we emit our voice, causes at once a squeezing out of certain particles, which produce a stream of breath, of such a character as to afford us the sensation of hearing.

Furthermore, we must suppose that smell too, just like hearing, could never bring about any sensation, unless there were certain particles carried off from the object of suitable size to stir this sense-organ, some of them in a manner disorderly and alien to it, others in a regular manner and akin in nature.

[54] Moreover, we must suppose that the atoms do not possess any of the qualities belonging to perceptible things, except shape, weight, and size, and all that necessarily goes with shape. For every quality changes; but the atoms do not change at all, since there must needs be something which remains solid and indissoluble at the dissolution of compounds, which can cause changes; not changes into the nonexistent or from the non-existent, but changes effected by the shifting of position of some particles, and by the addition or departure of others. For this reason it is essential that the bodies which shift their position should be imperishable and should not possess the nature of what changes, but parts and configuration of their own. For thus much must needs remain constant.

[55] For even in things perceptible to us which change their shape by the withdrawal of matter it is seen that shape remains to them, whereas the qualities do not remain in the changing object, in the way in which shape is left behind, but are lost from the entire body. Now these particles which are left behind are sufficient to cause the differences in compound bodies, since it is essential that some things should be left behind and not be destroyed into the non-existent.

Moreover, we must not either suppose that every size exists among the atoms, in order that the evidence of phenomena may not contradict us, but we must suppose that there are some variations of size. For if this be the case, we can give a better account of what occurs in our feelings and sensations.

[56] But the existence of atoms of every size is not required to explain the differences of qualities in things, and at the same time some atoms would be bound to come within our ken and be visible; but this is never seen to be the case, nor is it possible to imagine how an atom could become visible.

Besides this we must not suppose that in a limited body there can be infinite parts or parts of every degree of smallness. Therefore, we must not only do away with division into smaller and smaller parts to infinity, in order that we may not make all things weak, and so in the composition of aggregate bodies be compelled to crush and squander the things that exist into the non-existent, but we must not either suppose that in limited bodies there is a possibility of continuing to infinity in passing even to smaller and smaller parts.

HICKS

"Again, hearing takes place when a current passes from the object, whether person or thing, which emits voice or sound or noise, or produces the sensation of hearing in any way whatever. This current is broken up into homogeneous particles, which at the same time preserve a

certain mutual connexion and a distinctive unity extending to the object which emitted them, and thus, for the most part, cause the perception in that case or, if not, merely indicate the presence of the external object.

[53] For without the transmission from the object of a certain interconnexion of the parts no such sensation could arise. Therefore we must not suppose that the air itself is moulded into shape by the voice emitted or something similar; for it is very far from being the case that the air is acted upon by it in this way. The blow which is struck in us when we utter a sound causes such a displacement of the particles as serves to produce a current resembling breath, and this displacement gives rise to the sensation of hearing. "Again, we must believe that smelling, like hearing, would produce no sensation, were there not particles conveyed from the object which are of the proper sort for exciting the organ of smelling, some of one sort, some of another, some exciting it confusedly and strangely, others quietly and agreeably.

[54] "Moreover, we must hold that the atoms in fact possess none of the qualities belonging to things which come under our observation, except shape, weight, and size, and the properties necessarily conjoined with shape. For every quality changes, but the atoms do not change, since, when the composite bodies are dissolved, there must needs be a permanent something, solid and indissoluble, left behind, which makes change possible: not changes into or from the non-existent, but often through differences of arrangement, and sometimes through additions and subtractions of the atoms. Hence these somethings capable of being diversely arranged must be indestructible, exempt from change, but possessed each of its own distinctive mass and configuration. This must remain.

[55] "For in the case of changes of configuration within our experience the figure is supposed to be inherent when other qualities are stripped off, but the qualities are not supposed, like the shape which is left behind, to inhere in the subject of change, but to vanish altogether from the body. Thus, then, what is left behind is sufficient to account for the differences in composite bodies, since something at least must necessarily be left remaining and be immune from annihilation. "Again, you should not suppose that the atoms have any and every size, lest you be contradicted by facts; but differences of size must be admitted; for this addition renders the facts of feeling and sensation easier of explanation.

[56] But to attribute any and every magnitude to the atoms does not help to explain the differences of quality in things; moreover, in that case atoms large enough to be seen ought to have reached us, which is never observed to occur; nor can we conceive how its occurrence should be possible, i. e. that an atom should become visible. "Besides, you must not suppose that there are parts unlimited in number, be they ever so small, in any finite body. Hence not only must we reject as impossible subdivision ad infinitum into smaller and smaller parts, lest we make all things too weak and, in our conceptions of the aggregates, be driven to pulverize the things that exist, i. e. the atoms, and annihilate them; but in dealing with finite things we must also reject as impossible the progression ad infinitum by less and less increments.

YONGE

"Again, hearing takes place when a current passes from the object, whether person or thing, which emits voice or sound or noise, or produces the sensation of hearing in any way whatever. This current is broken up into homogeneous particles, which at the same time preserve a certain mutual connexion and a distinctive unity extending to the object which emitted them, and thus, for the most part, cause the perception in that case or, if not, merely indicate the presence of the external object.

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Post by “Cassius” of April 30, 2022 at 7:07 AM

My week has been busier than usual but this podcast will be up later today. Here are some notes made during final edit:

We get back in to the issue of eternal and unchanging "properties" of atoms (size, weight, shape) vs transient and changing "qualities" of combinations of atoms that we perceive through our senses.

This is a subject that we discussed most recently in terms of what it means to "exist" here: RE: Eikas Information

For the most part (especially after editing) I think our conversation is pretty clear, but this issue of the best terminology to use to discuss things that are eternal vs things that are not is something we really need to work on! There are a variety of words that get confusing if we don't really make ourselves clear. Here is an effort to organize these into a chart, but it's not complete and needs adjustment, because the "essential conjuncts" list (such things as weight to stones) is not quite the same thing as atomic size, shape, and weight), nor is something like "bondage" quite the same thing as color.

Things That Are Eternal (Atoms, which have size, shape, and weight)	Things That Are Not Eternal (Things about atoms that change, such as color)
Words Associated With Things In This Category:	Words Associated With Things In This Category:
Properties	Qualities
Essential conjuncts (Brown)	Events (or "Accidents")
Weight to Stones	Emerging
Heat to Fire	The color of combinations of atoms
Moisture to the Sea	The odor of combinations of atoms
Touch to Bodies	Human activities, such as The Trojan War

Lack of touchability to void	Bondage
	Liberty
	Riches
	Poverty
	War
	Peace

Source: Lucretius Book One (Brown)

[430] Besides, there is nothing you can strictly say, “It is neither body nor void,” which you may call a third degree of things distinct from these. For every being must in quantity be more or less; and if it can be touched, though never so small or light, it must be body, and so esteemed; but if it can't be touched, and has not in itself a power to stop the course of other bodies as they pass, this is the void we call an empty space.

Again, whatever is must either act itself, or be by other agents acted on; or must be something in which other bodies must have a place and move; but nothing without body can act, or be acted on; and where can this be done, but in a vacuum or empty space? Therefore, beside what body is or space, no third degree in nature can be found, nothing that ever can affect our sense, or by the power of thought can be conceived.

[449] All other things you'll find essential conjuncts, or else the events or accidents of these. I call essential conjunct what's so joined to a thing that it cannot, without fatal violence, be forced or parted from it; is weight to stones, to fire heat, moisture to the Sea, touch to all bodies, and not to be touched essential is to void. But, on the contrary, Bondage, Liberty, Riches, Poverty, War, Concord, or the like, which not affect the nature of the thing, but when they come or go, the thing remains entire; these, as it is fit we should, we call Events. Time, likewise, of itself is nothing; our sense collects from things themselves what has been done long since, the thing that present is, and what's to come. For no one, we must own, ever thought of Time distinct from things in motion or at rest.

[464] For when the poets sing of Helen's rape, or of the Trojan State subdued by war, we must not say that these things do exist now in themselves, since Time, irrevocably past, has long since swept away that race of men that were the cause of those events; for every act is either properly the event of things, or of the places where those things are done. Further, if things were not of matter formed, were there no place or space where things might act, the fire that burned in Paris' heart, blown up by love of Helen's beauty, had never raised the famous contests of a cruel war; nor had the wooden horse set Troy on fire, discharging from his belly in the night the armed Greeks: from whence you plainly see that actions do not of themselves subsist, as bodies do, nor are in nature such as is a void, but rather are more justly called the

events of body, and of space, where things are carried on.

[483] Lastly, bodies are either the first seeds of things, or formed by the uniting of those seeds. The simple seeds of things no force can strain, their solid parts will never be subdued. Though it is difficult, I own, to think that any thing in nature can be found perfectly solid; for heaven's thunder passes through the walls of houses, just as sound or words; iron in the fire grows hot, and burning stones fly into pieces by the raging heat; the stiffness of the gold is loosed by fire, and made to run; the hard and solid brass, subdued by flames, dissolves; the heat and piercing cold passes through silver; both of these we find as in our hand we hold a cup, and at the top pour water hot or cold: so nothing wholly solid seems to be found in nature. But because reason and the fixed state of things oblige me, here, I beg, while in few verses we evince that there are beings that consist of solid and everlasting matter which we call the seeds, the first principles of things, from whence the whole of things begin to be.

Post by “Cassius” of April 30, 2022 at 10:34 AM

Episode 119 of the Lucretius Today Podcast is now available. Today we continue in the Letter to Herodotus to make additional observations about perception through the mechanism of atoms. Please let us know any comments or questions you have in the thread below, and please be sure to subscribe to the podcast on your telephone or other podcast aggregator.

https://www.spreaker.com/episode/49605706

Post by “Don” of April 30, 2022 at 7:18 PM

‘by convention sweet and by convention bitter, by convention hot, by convention cold, by convention color; but in reality atoms and void’

Two truths doctrine - Wikipedia

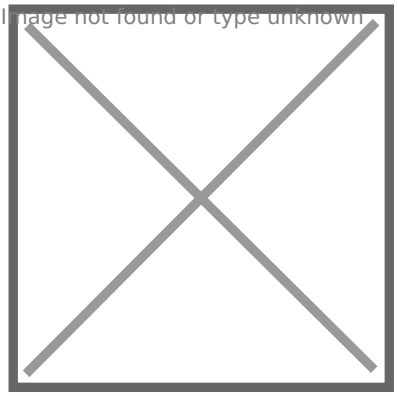
Great catch, Joshua , on the Democritus quote. I was unaware of that.

I can easily see Democritus' statement being used to describe the Buddhist doctrine of Two Truths with no difficulty whatsoever. In fact, the Wikipedia article uses "conventional truth" as one of the aspects of the Buddhist doctrine.

That said, I see no reason why that Democritean observation has to end with Buddhist ethics. There's nothing incorrect about Democritus' declaration. That's Epicurus's implication as well. In fact, I believe he says, to paraphrase, "it's atoms and void all the way down." BUT the "truth of reality" does NOT negate the fact that all we have to work with on a day to day basis is the conventional truth. We don't live on the level of "ultimate" truth. We live in the level of conventional, perceptible truth.

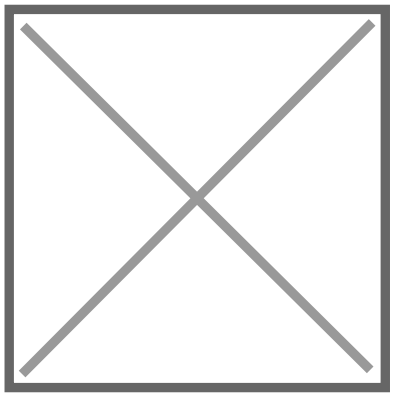
Post by “Don” of April 30, 2022 at 11:24 PM

Galatians 4:9



G4747 - stoicheion - Strong's Greek Lexicon (kjv)
G4747 - στοιχεῖον stoicheîon, stoy-khi'-on; neuter of a presumed derivative of the base of ; something orderly in arrangement, i.e. (by implication) a serial...
www.blueletterbible.org

The word translated as "elements" is στοιχεῖα. These can be elements as in chemical elements or "dirt" as Cassius paraphrased. But These are also elements or principles or "steps" as in the letter to Menoikeus. I've posted the link to Strong's concordance for Galatians. Here is the link to the KJV interlinear:



Galatians 4 :: King James Version (KJV)
Galatians 4 - But now, after that ye have known God, or rather are known of God, how turn ye again to the weak and beggarly elements, whereunto ye desire again...
www.blueletterbible.org

(Click on Tools at 4:9)

Interestingly, στοιχεῖα *is* the exact word Epicurus used in the letter to Menoikeus to talk about the "elements of a blessed life." But they can also be atoms.

Hmm... Am I going down Dewitt's path of seeing Epicurus around every Pauline corner? Not necessarily. BUT per LSJ, one of the definitions of στοιχεῖα *can* be "in Physics, στοιχεῖα were the components into which matter is ultimately divisible, elements, reduced to four by Empedocles, who called them ῥιζώματα, the word στοιχεῖα being first used...ἄτομας. Epicur.Ep.2p.36U.; equivalent to ἀρχαί"

Henry George Liddell, Robert Scott, A Greek-English Lexicon, στοιχεῖον

So, was Paul referring to returning to believed in the atoms espoused by Epicureanism? Unfortunately, I don't think so. Here's a compilation of biblical commentary:

Galatians 4:9 Commentaries: But now that you have come to know God, or rather to be known by God, how is it that you turn back again to the weak and worthless elemental things, to which you desire to be enslaved all over again?

It seems to me that an Occam's razor approach is more likely the στοιχεῖα definition of steps or "one in a series" sense of the word. In which case, it is the sense used in Menoikeus but need not have any connection to Epicurus's "elements of the blessed life." Especially since the same word is used a few verses earlier in Galatians 4:3:

"To the weak and beggarly elements - To the rites and ceremonies of the Jewish law, imposing a servitude really not less severe than the customs of paganism. On the word elements, see the note at Galatians 4:3."

Galatians 4:3 So also, when we were children, we were enslaved under the basic principles of the world.

Post by “Don” of May 1, 2022 at 8:12 AM

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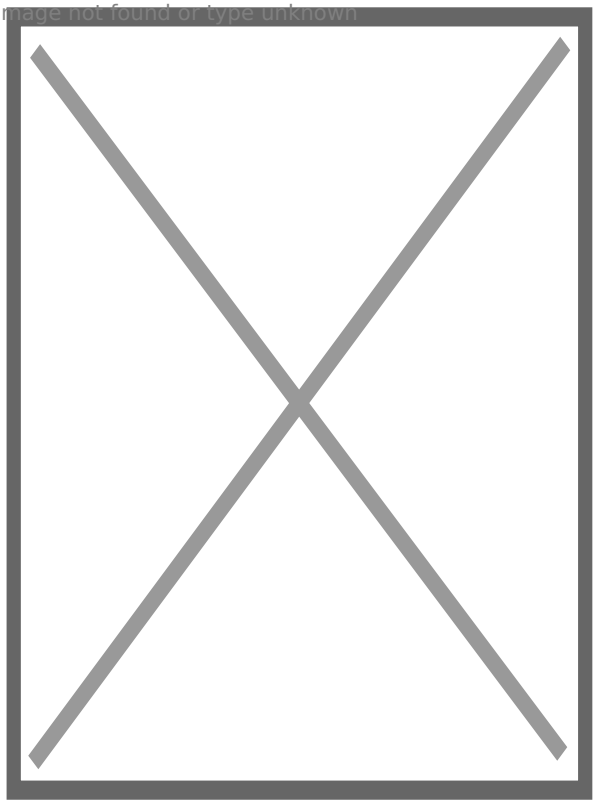

Democritus - Wikiquote
en.wikiquote.org

νόμωι (γάρ φησι) γλυκὺ καὶ νόμωι πικρόν, νόμωι θερμόν, νόμωι ψυχρόν, νόμωι χροιή, ἐτεῆι δὲ ἄτομα καὶ κενόν (Tetralogies of Thrasyllus, 9; Sext. Emp. adv. math. VII 135)

(nomōi (gar phēsi "for he says") gluku ("sweet" > glucose) kai nomōi pikron ("bitter"), nomōi thermon ("hot" > thermal), nomōi psykhron ("cold"), nomōi khroiē ("color"), eteēi de atoma kai kenon ("atoms and void" same words as Epicurus))

Sweet exists by convention, bitter by convention, colour by convention; atoms and Void [alone] exist in reality. (trans. Freeman 1948)[1], p. 92.

By convention sweet is sweet, bitter is bitter, hot is hot, cold is cold, color is color; but in truth there are only atoms and the void. (trans. Durant 1939)[2], Ch. XVI, §II, p. 353; citing C.

Bakewell, Sourcebook in Ancient Philosophy, New York, 1909, "Fragment O" (Diels), p. 60

νόμωι

Henry George Liddell, Robert Scott, A Greek-English Lexicon, νόμος

ἐτεῆι

Henry George Liddell, Robert Scott, A Greek-English Lexicon, ἐτεός

Post by “Cassius” of May 1, 2022 at 8:26 AM

For those interested in DeWitt's full thesis as to cross-references between Epicurus and Paul of Tarsus, DeWitt's full book can be read here:

Epicurism.info: http://epicurism.info/etexts/stpaulandepicurus.html

The old archived Epicurus.info: http://web.archive.org/web/2011030101...ndepicurus.html

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Post by “Joshua” of May 1, 2022 at 8:48 AM

Don, do you think there is a connection between 'elements' in that sense and the words of Jesus in Matthew 5:18?

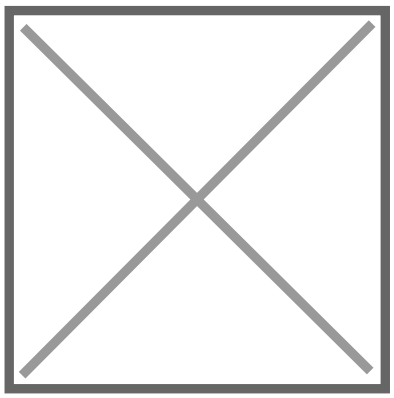
"For verily I say unto you, Till heaven and earth pass, one jot or one tittle shall in no wise pass from the law, till all be fulfilled."

Post by “Don” of May 1, 2022 at 9:33 AM

> Quote from Joshua

> Don, do you think there is a connection between 'elements' in that sense and the words of Jesus in Matthew 5:18?
>
> "For verily I say unto you, Till heaven and earth pass, one jot or one tittle shall in no wise pass from the law, till all be fulfilled."

Interesting question! That would be one interpretation; however, in light of the info below, it would seem to refer specifically to the *written* law, the Torah.



Matthew 5 :: King James Version (KJV)
Matthew 5 - And seeing the multitudes, he went up into a mountain: and when he was set, his disciples came unto him:
www.blueletterbible.org

jot = ἰῶτα

Henry George Liddell, Robert Scott, A Greek-English Lexicon, ἰῶτα

tittle = κεραία "in writing, apex of a letter"

Henry George Liddell, Robert Scott, A Greek-English Lexicon, κεραία

Post by “SimonC” of June 21, 2022 at 8:11 AM

A thought on the inconceivability of visible atoms: according to Epicurus, things are visible because they constantly emit thin films of atoms. But a single atom can't emit a film smaller than itself and is therefore not visible in the ordinary sense.

BUT, this raises the question of how we could even tell whether huge atoms exist. Since we can't see them anyway, how can we rule out the existence of basketball sized atoms? Is there a

contradiction here?

Post by “Cassius” of June 21, 2022 at 8:42 AM

> Quote from SimonC
>
> A thought on the inconceivability of visible atoms: according to Epicurus, things are visible because they constantly emit thin films of atoms. But a single atom can't emit a film smaller than itself and is therefore not visible in the ordinary sense.

I think that's a really perceptive observation SimonC as to single atoms not giving off images!

As to the basketball size single atoms, maybe one answer there is that while such a thing might not give off an image, such a thing would (presumably?) be very "touchable" and we would be able to "feel" its presence even if it didn't give off particles to see, hear, or smell (?)

But I really like your observation that a single atom would not give off an image. I think that sounds right to me - anyone disagree?

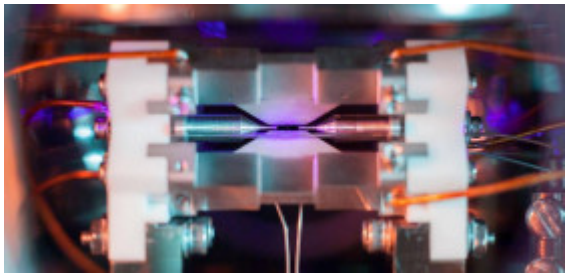
As of today we'd presumably look at the issue differently and talk about light bouncing off things, and I really don't know that Epicurus rejected the issue of light bouncing either. But to the extent we would talk about receiving "images" I think your logic is sound - a single atom couldn't give off an image from its surface.

Then of course we'd have to consider whether every use of the word "image" is really the same thing. Epicurus seems to talk about "receiving images" as different from "seeing things" (at least at times) so maybe what we're really observing is that a single atom would not give off an "image" that could be "perceived directly by the mind" as opposed to "seeing it" with our eyes.

Now I am rambling but this kind of thinking really strikes me as "thinking like an Epicurean." I bet if we turned this over in our minds just a little we could develop a coherent set of observations about this, but it would need to take into account the difference between "receiving images" and "seeing things" which I don't think to be exactly the same thing.

Post by “Eikadistes” of June 21, 2022 at 9:26 AM

The observation that *atomi* do not emit *eidola* is consistent with the physics that explains the methods used to take this award-winning photo of a "Strontium atom" (which is *actually* a re-emission of laser light):



"*An image of a single positively-charged strontium atom, held near motionless by electric fields, has won the overall prize in a national science photography competition, organised by the Engineering and Physical Sciences Research Council (EPSRC).*" (https://www.ox.ac.uk/news/science-b...otography-prize)

From a National Geographic article about taking a picture of a Stronium atom: "*Atoms are infinitesimally small, measuring only a miniscule fraction of an inch in diameter. At 38 protons and 215 billionths of a millimeter across, strontium atoms are relatively large by comparison. Still, the only reason why we can see the atom in the photo is because it absorbed and then re-emitted laser light at a speed capturable by a long camera exposure. So, the photo is actually of the laser light being re-emitted, rather than the outline of an atom. Without the long exposure effect, the atom wouldn't be visible to the naked eye.*" (https://www.nationalgeographic.com/science/articl...competition-spd)

If large, invisible particles exist, according to Epicurean physics, then they should still form compounds which *can* be seen. They could have reasoned that there are no compounds that, when broken, simply ***poof*** into an invisible realm of large particles. For example, there is not a mineral that can get split in half, and then both halves suddenly disappear. Everything we observe seems to dissolve, eventually, into something that is at least finer than dust.

Post by “Don” of June 21, 2022 at 10:49 AM

That photo is exactly where I was heading, @Nate . Thanks for posting!

Post by “SimonC” of June 21, 2022 at 11:44 AM

> Quote from Nate
>
> *If* large, invisible particles exist, according to Epicurean physics, then they should still form compounds which *can* be seen. They could have reasoned that there are no compounds that, when broken, simply ***poof*** into an invisible realm of large particles. For example, there is not a mineral that can get split in half, and then both halves suddenly disappear. Everything we observe seems to dissolve, eventually, into something that is at least finer than dust.

That's a good point. Is it possible that this is what Epicurus meant? By atoms so large they fall within our ken, he might not have meant seeing the atoms themselves floating around like balls but more like things being more granular than we normally see.

Or being experienced by touch as stated above.

Post by “Don” of June 21, 2022 at 11:22 PM

This is a fascinating thread of this conversation. Thanks for starting it, SimonC

I am still gobsmacked by that photo... even after three years.

Here's a larger image link from Reddit: https://i.redd.it/ib66b4sje7e31.jpg

I also think ya'll are on the right track with the lines of reasoning, too, about why we don't have basketball sized atomoi or why we can't see them.

Post by “Godfrey” of June 22, 2022 at 1:06 AM

In modern physics we're unable to measure things smaller than a certain size because the act of measuring will affect the thing being measured. For example, something smaller than a photon cannot be observed/measured using light, and something smaller than an electron cannot be measured using an electron microscope. There's a name for this which escapes me; hopefully someone has the name at hand and can correct me if I've mis-stated it.

This would be the modern equivalent of a single atom not being able to emit a film.

Post by “Don” of June 22, 2022 at 5:58 AM

I don't think it's what you're referring to, Godfrey , but, if I remember, the smallest size anything can be is the Planck length:

The Planck scale: relativity meets quantum mechanics meets gravity. (from Einstein Light)

Post by “Martin” of June 22, 2022 at 7:03 AM

Godfrey's comment #16 appears to be somewhat off or misleading.

That the act of measuring affects the thing being measured is related to the uncertainty principle of quantum theory.

We do not know the size of photons and electrons. The smallest feature we can measure is given by the wavelength of the photons, electrons or whatever other probes we use multiplied by a factor. By increasing their energy, the wavelength becomes smaller, and correspondingly, smaller features can be resolved. That is why physicists who work with accelerators keep pushing for higher energies.

Within Epicurean physics, atoms are hard bodies. If they were large and not emitting anything, they would at least be visible as shadows.

Epicurus' concept of bodies emitting films appears to be an inconsistency within his physics and does not match modern physics. I see no convincing analogy there.

Post by “Cassius” of June 22, 2022 at 7:18 AM

> Quote from Martin
>
> Within Epicurean physics, atoms are hard bodies. If they were large and not emitting anything, they would at least be visible as shadows.

Yes that makes sense too, which is along the lines that they ought to be "touchable."

I also think that as raised earlier a very precise discussion of this would need to account for the apparent Epicurean position that "images" (at least some of them) are or can be invisible.

(I know I am addressing only part of Martin's comments here but I don't have comment yet on the rest.)