Is there such a thing as 'Greek Atomism'?

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Abstract In this article I look at the term 'Greek atomism' which is often used in a misleading way. 'Atomism' is a modern term, it was coined in the seventeenth century; the Greeks did not have a corresponding one, they referred to the philosophies of Democritus (and Leucippus) and Epicurus as very distinct doctrines, rather than the two representing the same philosophical system. And they had good reasons for doing so as there are considerable differences between Democritus and Epicurus. The presentation of some of these differences as well as the atomist doctrine introduced in the seventeenth century by Pierre Gassendi will form the core of the article. It will lead to the conclusion that the term 'atomism' often means Gassendi's version and it conjures up an image of billiard balls bouncing of each other which is inadequate to deal with the Epicurean doctrine and misleading when approaching Democritus.

Resumo Neste artigo, considero a expressão 'Atomismo Grego', frequentemente utilizada de modo ambíguo. 'Atomismo' é um termo moderno, cunhado no século XVII. Os Gregos não tinham um termo correspondente, referiam-se às filosofias de Demócrito (e Leucipo) e de Epicuro como doutrinas marcadamente distintas, mais do que enquanto representantes do mesmo sistema filosófico. E tinham boas razões para o fazer, pois existem diferenças consideráveis entre Demócrito e Epicuro. A apresentação de algumas dessas diferenças, bem como a doutrina atomista introduzida por Pierre Gassendi no século XVII, constituem o núcleo do artigo. Sustentam a conclusão segundo a qual o termo 'atomismo' significa frequentemente a versão de Gassendi e evoca a imagem de bolas de bilhar colidindo umas com as outras, uma imagem inadequada para lidar com a doutrina de Epicuro e enganadora no que diz respeito a Demócrito.

Although a number of studies show that atomism never disappeared, it is nevertheless true that since antiquity it occupied a marginal (to say the least) place in philosophical preoccupations and only regained some prominence in the 17th century mostly due to the work of Pierre Gassendi.

In his time, Gassendi had the reputation of a scientist of the highest rank. However, viewed from the historical perspective his contribution to science was unremarkable; he made no significant scientific discoveries, there is no Gassendi law, for example. However, his great merit was the introduction of atomism into scientific thought; it was an ontological hypothesis that the science of his time needed.[1] Gassendi's reconstruction of the ancient system (and what some of this entailed, I will return to later) has been accepted as what goes under the term 'atomism' and sometimes is referred to, wrongly, as 'Greek atomism'.

When one goes back to the early days of the doctrine, namely to the thought of Democritus, and begins to examine the matter closely, one quickly discovers that we are taught the atomist doctrine poorly with the result being that when we hear the word 'atomism' the image of billiard balls bumping off each other immediately springs to mind like a knee-jerk effect. This image is wrong. The thought of the Greeks was far more subtle and complex than the mechanistic world commonly associated with it.

The hopelessly meagre fragments of Democritus that have come down to our times set a limit to what can be said with confidence about his thought.[2] Nevertheless, it is clear that Democritus' system was coherent and consistent. This was at least Aristotle's view;

[1] Koyré, 1973, 321.

[2] Strictly speaking one should speak of Democritus and his predecessor Leucippus. But so little is known about the earlier man that apart from laying down the basics of the doctrine nothing of any detailed thought can be attributed to him.

although he makes his disagreements plain, he shows immense respect for the man, often singling him out as the most astute. Aristotle devoted a monograph to him, which has not, however, survived to our times either. Plato's reaction to Democritus also deserves attention. According to Diogenes Laertius a story circulated that he wanted to burn Democritus' writings.[3] Diogenes goes on to say that Plato was only dissuaded from this when it was pointed out to him that the circulation of the writings was so wide that he could not succeed in destroying them all. One can believe the story or not. On the one hand Diogenes takes as his source a certain Aristoxenus who was apparently notorious for spreading libellous gossip, and therefore not trustworthy; on the other hand, the sentiments that Plato expresses in the *Laws* make it plain that burning books would have been well within his range. (And since this was the fate of Protagoras' books[4] the Athenians would have tolerated such a measure.) What is, nevertheless, incontestable is that in all his writings Plato not even once mentions Democritus' name; and it is this that makes Diogenes think the story might be true.

What was it that Plato found so unacceptable? Clearly, a doctrine that lacked any sign of teleology and divine design must have been anathema to him. But if Democritus had argued it through a primitive mechanistic atomism Plato would have had no difficulty in destroying the arguments. We know from his treatment of the Sophists that when dealing with opponents he did not shirk from conflict and was capable of underhand tactics; why not do the same to Democritus? Diogenes thought that Plato feared having 'to match himself against the prince of philosophers'.[5] Maybe; but it still does not tell us anything concrete about Democritus' views (and Diogenes' own account is too brief and

[3] Diogenes Laertius, 1980, X 40.
[4] Diogenes Laertius, 1980, IX 52.
[5] Diogenes Laertius, 1980, IX 40.

sketchy to be of much help). Nevertheless, everything suggests that he was a philosopher of immense depth.

In post-Ancient times, atomism practically disappeared, in the intellectual climate dominated by the teachings of St Augustine there was no place for such a godless theory. When it was re-introduced by Pierre Gassendi into scientific thought in the 17th century it was based in principal on the later Epicurean version which in a number of respects differs from the system of Democritus. Some differences between Democritus and Epicurus are apparent quite immediately. The first, relevant in this context, concerns the conception of the atom. While Democritus did not accord the atoms the property of weight (at least that is the view of the majority of scholars), Epicurus did assign weight to atoms. As a consequence the natural movement of the atom is a downward vertical fall. However, no life would emerge if the atoms just fell in a straight line

> One further point in this matter I desire you to understand: that while the first bodies are being carried downwards by their own weight in a straight line through the void, at times quite uncertain and uncertain places, they swerve a little from their course, just so much as you might call a change of motion. For if they were not apt to incline, all would fall downwards like raindrops through the profound void, no collision would take place and no blow would be caused amongst the first beginnings: thus nature would never have produced anything.[6]

This 'swerve' is known by its Latin rendering the *clinamen* (from *clinare* – to incline). This swerve makes atoms collide, which, in turn, form vortexes from which various forms of life emerge. The *clinamen* was also the principle of indeterminacy in Epicurus' system,

> it break[s] the decrees of fate, that cause may not follow cause from infinity, whence comes this free will in living creatures all over the earth, whence I say is this will wrested from the fates by which we proceed

[6] Lucretius, 1982, 2.216-2.224.

> whither pleasure leads each, swerving also our motions not at fixed times and fixed places, but just where our mind has taken us?[7]

Gassendi 'cleaned up' the doctrine to make it acceptable to the Church (of which he was himself a loyal servant). He removed the *clinamen* and made the atoms move in all directions in conformity with Democritus' thought. He also removed the notion of multiple worlds which Epicurus argued and which had also been earlier advanced by Democritus.

The great merit of Gassendi was to argue for the legitimacy of the concept of the void, which he perceived as empty space in which atoms move. This new version of atomism was adopted by Newton, it was the kind of hypothesis that science of the time needed and it was on the whole accepted by the scientific community, although there was also some opposition (Ernst Mach and Wilhelm Ostwald, the most notable examples). At the beginning of the 20th century, the French experimentalist Jean Perrin confirmed the atomist hypothesis and it was practically universally accepted.

However, the atomism that re-emerged in the 17th century was a lifeless mechanics that could only be given some sense by positing an omniscient God who arranges that matter conform to a divine scheme, manifest in the immutable laws of nature. In time God was deemed unnecessary, 'Sire, I had no need for that hypothesis' declared the astronomer Pierre-Simon de Laplace, the laws of nature were so precise, he claimed, that in principle any past or future event could be deduced from these laws if it were possible to take all the factors into account. This was not the vision of either Epicurus or Democritus.

To see the problem more clearly let us begin with this sentence that opens Werner Heisenberg's reflections on the ancient doctrine:

[7] Lucretius, 1982, 2.254-2.260.

> The concept of the atom [...] has its origin in ancient Greek philosophy and it was in that early period the central concept of materialism as taught by Leucippus and Democritus.[8]

This statement may seem to be a fair reflection of the thought of the ancient sages but, as it happens, not altogether; in fact, it is somewhat misleading. This is not the way the Ancients presented the doctrine, the most common opening formula that they used was almost always the same: Aristotle stated that 'Leucippus and his associate Democritus say that the full and the empty are the elements'[9], Aëtius states: 'Leucippus of Miletus says that the filled and the void are principles and elements', Diogenes Laertius: 'The All includes the empty as well as the full' and finally Cicero repeats the same 'Leucippus admits two principles: the filled and the void'.

This way of presenting the doctrine suggests that these early Greeks did not begin with atoms but with a dichotomy, an oscillation between what is and what is not, that is, they begin with a dialectics of presence and absence. But there is more to it than just a dichotomy, in Democritean terms the atom and the void are presented in three different ways, all three stating them as opposites, aside the 'the full and the empty' formula, the two elements are presented as 'the existent and the non-existent' and 'the thing and the nothing'. At least two commentators, David Sedley and Frédéric Nef, have arrived at a conclusion, independently, it seems, that Democritus might have been conceiving of a negation of substance, 'the void is the privation or negation of the full'[10], the void is 'not empty space but the negative substance which occupies empty space'.[11]

One cannot go any further than these conjectures, but one thing is clear, the void of Democritus is complex and it certainly cannot be

[8] Heisenberg, 1990, 47.
[9] *Metaphysics*, Bk I, Ch. 4, 985b.
[10] Nef, 2011, 113.
[11] Sedley, 1982, 179.

reduced to Newtonian empty space. And there is a further point to be made about presenting the Ancient doctrine as having the atom as its central concept, as Heisenberg does – as a consequence the void is pushed into the background. Yet, it was not the idea of the atom that was the most original ingredient of the theory; it was the concept of the void that distinguished it most. This was a contentious proposition from the beginning. It was attacked by the Eleatic philosophers; Aristotle pronounced himself against it. The fact that the Greeks did not have the concept of zero also must have affected their thinking. (What would the Pythagorean system look like if it had to incorporate zero into it?). The mediaeval thought rejected the void with such meaningless utterances as 'nature abhors the vacuum'. Western philosophy's agenda was dominated by the intricate scheme of the Great Chain of Being, which, following the 'principle of plenitude, (that is, that God does not allow any potentiality for being to remain unfulfilled) expressly forbade the void.[12] Interestingly, many of the scientists and philosophers who were inclined to adopt the atomist theory went along with it only as far as the concept of the atom was concerned but did not accept the void. It was argued that the space between the atoms had to be filled with some very subtle substance. Descartes spoke of a 'subtle matter', which was most often referred to as ether, which would function as an omnipresent medium. Newton, too, throughout his life thought, on and off, of incorporating the idea of ether into his thinking. The final scheme of Newtonian mechanics is based on solid bodies moving in empty space; void is no more than a passive container.

The fact that the void (empty, nothing, non-existent) was consistently seen as the opposite of substance (full, thing, existent) already takes us away from the 'space the container' image of the

[12] On this see *The Great Chain of Being* by Arthur Lovejoy (1964). It is, in fact, Lovejoy who coined the very helpful expression 'the principle of plenitude'.

void. The void is an element itself and so it shares some characteristics of the 'full'; it is also capable of locomotion, for example, something that we can imagine when thinking of a moving gap between cars in the traffic or a vacuum in a thermos flask that we carry around.[13] Other testimonies indicate that the void is not passive; it is also the cause of things:

> [...] they [Leucippus and Democritus] say being no more is than non-being [...]; and they make these the material causes of things.[14]

Finally, we must consider the following comment of Aristotle:

> But people really think that there is an empty interval in which there is no sensible body [...] interval, different from the bodies, either separable or actual – an interval which divides the whole body so as to break its continuity, as Democritus and Leucippus held.[15]

The void is a force, a force that 'breaks up' and 'divides', because of the void reality is discontinuous.[16] Discontinuity as a principal feature of reality is perhaps the most lasting legacy of Democritean thought. '[Q]uantum theory dates 24 centuries further back, to Leucippus and Democritus. They invented the first discontinuity – isolated atoms embedded in empty space'.[17] (This may sound very similar to Heisenberg's statement but Schrödinger emphasises the discontinuous nature of reality while Heisenberg speaks of atoms as

[13] The remainder of this section has been largely influenced by an article by David Sedley: "Two Conceptions of the Vacuum" (1982), which gives a most insightful analysis of the problem of the void in the thought of the Greek sages.
[14] *Metaphysics*, 985b5.
[15] *Physics*, 213a27-b1.
[16] This means that in Democritus' thought discontinuity is constituted by the void and not by such concepts as limit or rupture. This would also mean, for example, that atoms could not push out the void into the periphery and huddle together to form a continuous material reality. (This is an idea that we find in the thought of the Stoics.)
[17] Schrödinger, 1996, 158.

basic building blocks of reality, which is quite a different focus.) This sense of discontinuity is further heightened by the realisation that the void might have been conceived as the negation of the atom; discontinuity is a consequence of an act of negation. What exact form this negation took cannot be ascertained, but it seems quite clear that it is a 'no' that introduces a discontinuity.

The preceding remarks allow us to identify three distinct systems based on the concept of atoms and the void; here is a brief resume of some of the features that each one presents us with:

1. The system of Leucippus and Democritus presents a multiplicity, a dialectics of the void and the atom, negation and indeterminacy which is a consequence of discontinuity.
2. The Epicurean system also presents a multiplicity. We do not find in it, however, either the problem of negation or discontinuity; the indeterminate character of reality is the consequence of the workings of the unpredictable *clinamen*; deviation is the source of variety and changeability. The void is empty space (this space, however, should be conceived as vectorial rather than metric).
3. If Laplace is taken to be the crowning of Gassendi's atomism then we are presented with a world of atoms in the empty void that is governed by immutable laws. It may be a godless universe but these laws operate as much as St Augustine's doctrine of predestination, as we could, for example, in principle calculate which species are destined for extinction. Such a calculation is not in reality possible but that is what makes it so alike predestination; the iron grip of inevitability is certain, only that it remains just as unfathomable as the workings of God. This is not surprising, because the very notion of a fixed immutable universal physical law has its origins in theology.

To sum up these observations one can begin by noting that the term 'atomism' is complex and the seemingly simple formula: 'there are only atoms and the void' has given very distinct philosophical outlooks. To end these remarks a comment on the term 'atomism' is necessary. 'Atomism' is a 17th century coinage, the Greeks did not have an equivalent term, they spoke of the philosophy of Democritus (and Leucippus) or the Epicurean system and did not collapse them into some unified overview, as the so often used term 'Greek atomism' obviously does. It does not make much sense to talk of 'Greek atomism' as there is little sense in talking about 'Indian atomism'.[18] The Greeks distinguished clearly between the earlier and later doctrines and this is apparent when we compare the entries 'Democritus' and 'Epicurus' in Diogenes Laertius' *Lives of Eminent Philosophers* (Books IX 34–49 and X, respectively). These are two different men, from different epochs, with different temperaments, who do, of course, also share many convictions (materialism, lack of *telos* or divinity). The term 'atomism' is an obstacle in that it conjures up an initial guiding image of billiard balls bouncing off each other, which shapes the thought; it does not do justice to Epicurus and it is certainly misleading with respect to Democritus.

As for Democritus this is an interesting comment:

> one can imagine a scholar of the young School of Athens paying a holiday visit to Abdera [...], and on being received by the wise, far-travelled and world-famous old gentleman Democritus, asking him questions on the atoms, on the shape of the earth, on moral conduct, God, and the immortality of the soul – without being repudiated on any of these points. Can you easily imagine such a motley conversation

[18] Paul Masson-Oursel recognizes four different atomist systems in India (Jaina, Buddhism, Vaiseisika and Nyaya (Masson-Oursel, 1925). And even this could be extended as the atomist thinking in Buddhist thought, at least, evolved; the somewhat materialistic atomism of the early Buddhism is very different from the temporal atomism advanced by the Dignaga – Dharmottara - Dharmakirti school that was active between the 5th and 7th centuries.

> between a student and his teacher in our days? Yet, in all probability, quite a few young people have a similar – we should say quaint – collection of inquiries on their minds, and would like to discuss all of them with the one person of their confidence.[19]

These are the words of Erwin Schrödinger, a great admirer of the Greek sage. Democritus was a philosopher of great depth, immensely richer than what goes today under the banner of 'Greek atomism'. The same goes for Epicurus. 'Atomism', as it is used, is a term that oversimplifies, it should not be used when referring to the Greeks, the finesse of their thought gets lost and with it precious philosophical insight.

[19] Schrödinger, 1996, 14.

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