Philoponus's Traversal Argument and the Beginning of Time

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Richard Sorabji has argued that John Philoponus' arguments for the claim that time must have had a beginning are good ad hominem arguments against Aristotle. However, he claims that they do not show that time must have had a beginning. I argue that one of those arguments, the traversal argument, is unaffected by Sorabji's major criticisms. Sorabji fails to take account of the fact that the argument is not merely based on logical considerations, but on a theory of time.

Introduction

The sixth century Alexandrian Christian philosopher John Philoponus is known only to specialists. Yet research has shown that he is a very important figure in the history of science and philosophy. In particular, it has been shown that his critique of many of Aristotle's scientific claims was important in the development of physics. Richard Sorabji and Herbert Davidson have recently argued that another of Philoponus's intellectual contributions was very influential, his arguments against Aristotle's view that the world is everlasting (Davidson, 1987; Sorabji, 1983:210–224; Sorabji, 2010a, 2010b).

Sorabji says that Philoponus' arguments against the eternity of the world were so subtle that it took eight hundred years before thinkers managed to plausibly criticise them. On his account, discussion of them led to important developments in the understanding of infinity and in expanding the range of options available in cosmogony.[1] However, he also argues that until recently no one grasped Philoponus' originality as they were mistakenly attributed to the thirteenth century western thinker Bonaventure. In fact, he shows Bonaventure was only repeating Philoponus' arguments and examples.

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[1] Sorabji says that recent research shows that Archimides and an Arab writer of the tenth century had the mathematical resources to criticise the arguments. However, no one used those resources to criticise the arguments until the fourteenth century (Sorabji, 2010:24–25).

To understand Philoponus' intellectual contribution, we need to grasp that, as far as we can tell, amongst pagan philosophers no one defended the view that the universe and time began. Those who believed in divine designers or makers, such as Plato in the *Timaeus*, believed that the universe and time had always existed. However, they thought that the designer or maker had brought into existence ordered time and imposed a law like order on matter. Nearly all Pagan philosophers believed that the statement that nothing can come from nothing is obviously true. Neo-Platonists thought that the world was everlasting, but that the divine was a 'creator' only in the sense that without the divine, the order, and perhaps the matter, in the world would cease to exist. Some Jews and Christians agreed with the Neo-Platonists on this point. By contrast, other Jews and Christians thought that God had brought the universe and time into existence. Before Philoponus, Christian thinkers had sometimes responded to criticisms of the claim that the universe and time began. They had argued that there was no good reason for the claim that the universe and time are everlasting. However, Philoponus seems to have been the first person to argue in detail that the universe and time **must** have begun (Sorabji, 1983; Gregory, 1997).

Despite the historical importance of Philoponus, Sorabji argues that his arguments do not show that time must have had a beginning; they only work as arguments against someone who accepts Aristotle's assumptions about infinity. While Sorabji deserves great praise for bringing these neglected arguments to light, I will argue that he underestimates one argument, the traversal argument.

Background to the Traversal Argument

Before I begin my detailed exposition of the traversal argument, I will start with some remarks about types of arguments. We need to understand the type of argument Philoponus is presenting to see whether Sorabji's criticisms are adequate.

There are at least two types of arguments:

1) An argument in which we take the position we want to criticise and show that the position leads to inconsistencies or some other absurdity. Someone wanting to show that the universe cannot have an infinite past would assume that it did have an infinite past, and try to show that inconsistencies follow. Perhaps Philoponus' infinity arguments are of this type. We will see that Philoponus' traversal argument is not of this type.

2) An argument which takes as a premise a view different to the position criticised, and argues on the basis of it that the view criticised can't be true. We will see that Philoponus' traversal argument is of this type. He argues on the basis of assumptions which he takes to be true about **the nature of time** that an infinite past is impossible.

It is reasonable to bar arguments that are criticisms of a position that is different from the one in question. Suppose an argument of type 1 is produced which uses a

different premise from the position in question. It is legitimate to respond to that argument by pointing out that the premise is **not** the assumption of the position criticised. For instance, if the position criticised is that past time is infinite, it is not correct to assume in the criticism that past time is infinite but also began. It would be legitimate to respond to the criticism by pointing out that the assumption of the position criticised is that time had no beginning. However, if an argument is of the second type, it is **question-begging** to respond to criticism by pointing out that the position criticised holds that time had no beginning, for that is the very question being debated.

We will see that this is important in discussing Sorabji's criticisms, for Sorabji writes as if Philoponus is producing the first type of argument when he is producing the second type of argument.

The Traversal Argument

The traversal argument occurs in Philoponus' commentary on Aristotle's *Physics*. He notes there that Aristotle holds that the universe and time are everlasting but also argues that actual infinities are impossible. He wants to agree with Aristotle that actual infinities are impossible though he wants to argue that one cannot coherently hold that the universe and time are everlasting. Part of his reason is that an infinite past time is really a kind of actual infinity. This is why he repeats Aristotle's arguments against actual infinities and adds further arguments of his own. However, he is aware that Aristotle seems to argue in response to such arguments that an infinite past time is not an actual infinity because the past has ceased to exist. Criticising Aristotle's response, he comments

> ...I say that existence is possible for the numerically unlimited (apeiron) rather as presently existing than as past, for what presently exists need not be completely traversable (diexititon), but what is past is necessarily traversable — which is impossible. (Vitelli, 1887:430; Edwards, 1994:96–7)

Philoponus' claim here is that, contrary to Aristotle, an infinite past time is not less, but more problematic than a presently existing spatial infinity — even if we thought that a presently existing infinity were possible, an infinite past time is impossible. The reason he gives is that the path through the past to the present is necessarily traversable whereas the path through a presently existing infinity need not be traversable. What he means by "traversable" is unclear here.

In his *Against Proclus* he puts a clearer version of the traversal argument:

> For the very same reason (aitia) that the infinite (apeiron) cannot exist all at once and at the same time it cannot emerge into actuality by existing a bit at a time. For if it were at all possible for the infinite to have emerged into actuality by existing a bit at a time, what further reason (logos) could there be to prevent it from also existing in actuality all at once? For it would seem much more impossible to claim that the infinite is brought to actual birth bit by bit and, as it were, to be counted out one unit (monas) after another

than that it exists all at once and at the same time. For if it exists all at once, perhaps there will be no need to go through it unit by unit, and actually, as it were, count it off; but if it comes to be a bit at a time and one unit always exists after another, so that eventually an actually infinite number of units has come to exist, even if it does not exist all at once at the same time because parts of it have ceased to exist while parts [still] exist, it has nevertheless become traversable, which is impossible. [But] this - I mean the traversing of the infinite by, as it were, counting it off unit by unit – is impossible, even if the counter were everlasting. For the infinite is by its nature untraversable; otherwise it would not be infinite. (Rabe, 1899:10; Philoponus, 2005:24)[2]

Someone focussing on the first two sentences of this passage might think that Philoponus intends the traversal argument to be simply a restatement of his arguments about infinity as such plus the claim that a past infinity is an actual infinity that has come into being a bit at a time. However, the sentence which starts the traversal argument begins with "[F]or it would seem much more impossible...". This suggests that Philoponus thinks that there is an extra impossibility in traversing an infinite past. It implies that we could reject the infinity arguments but still accept the traversal argument. The reason is that a temporal infinity is such that it necessarily can be counted off unit by unit in succession because it comes into being in that way. Each member of the succession can only be counted off if the preceding member has been counted off.

We see that this is what Philoponus has in mind when we examine some of the Arabic summary of a later treatise in which he presented all his central arguments against the pagans in an axiomatic manner. A key part of the summary states the principles (axioms) from which he argues. Here is the statement of two of the principles: "The first of these principles is that it is impossible for anything which requires to exist in order to exist (another) thing to exist, if its (existence) is not preceded by the existence of the thing whose existence is required... The third principle is that the existence of anything for whose (coming into being) it is requisite that it be preceded by the coming into being of an infinite (number of) things that precede (it) is impossible" (Pines, 1972:330–331).[3] Interpreting the traversal argument in the light of these two principles in the Arabic summary, we see that he has an underlying view about time. Time comes into existence in units, each of which must come into being before the next one can come into being. The traversal metaphor is not crucial to the argument. What is crucial is the way in which time comes into being.

It is at first sight a little puzzling that Philoponus' does not spell out his view of the nature of time in his criticisms of Aristotle. However, if we turn to his commentary on Aristotle's *Physics* we will see why. He there approvingly presents Aristotle's view

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[2] The Greek word Philoponus uses for "units" is "monades", literally "singles". It is usually used to indicate quantities of non-zero size. I think that here it means quantities of equal non-zero size. For a very brief discussion of the use of the term, see Aristotle, *Metaphysics*, 1089b:35.

[3] Simplicius attributes some very similar premises to Philoponus in discussing another argument against Aristotle (Wildberg, 1987:144).

of time as the view that time flows (Vitelli, 1887:719–727; Broadie, 2011:21–31). Jon McGinnis has recently argued that in interpreting Aristotle in this way, Philoponus formulates a view about time which is highly original and which profoundly influenced interpretations of Aristotle down to very recent times. According to McGinnis, Philoponus formulates this view because he assumes that Plato's and Aristotle's theories of time are the same (McGinnis, 2003). There has been much recent debate about whether Aristotle really believes that time flows. McGinnis argues the Philoponus is original because the view that time flows is not to be found in Aristotle though it is implicit in Plato's *Timaeus*. Whether McGinnis is right or not about Philoponus' originality and influence, he is clearly right about the way in which Philoponus interprets Aristotle. Further, the view that time flows fits the phenomenology of time extremely well. So presumably that view would have seemed obviously true to Philoponus.

The view that time flows is standardly called the A theory of time. An alternative view of time, which is that it is really another dimension laid out eternally just like the three spatial dimensions, is standardly called the B theory of time. The distinction between the A theory and B theory of time originates with John Ellis McTaggart, who thought that the A theory is inconsistent (McTaggart, 1908). In the light of McTaggart's arguments about the A theory and the Minkowski interpretation of Einstein's Special Theory of Relativity, many physicists and philosophers now argue that time does not flow (Minkowski, 1952). On this B theory view, our phenomenology is misleading as to the nature of time. I will not here discuss the merits of each theory of time. For my purposes, it is sufficient to grasp that Philoponus holds the A theory of time and that the A theory underlies the traversal argument. Let me turn to reconstructing the traversal argument, including Philoponus' unstated presuppositions, by using modern terminology and leaving out the misleading metaphor of traversal.

Reconstructed "Traversal" Argument

1) The past and the present consist of time units (monades).

2) If the A theory of time is true, time has come into existence successively as a series of units.

3) If the A theory of time is true, each unit of time (except a first unit) can only come into existence when its predecessor has come into existence before it.

4) The A theory of time is true.

5) There cannot exist a present member of an infinite series of units in which each member, past and present, could only come into existence after its predecessor has come into existence. ("After" is here used in an A theory sense.)

6) No unit of time can come into existence that has an infinite series of units preceding it coming into existence in succession before it (inferred from premises 1 to 5).

7) All units preceding a present unit are past units that came into existence in succession before it.

8) A present unit exists.

Thus, 9) there cannot be an infinite number of past units.

Sorabji's Criticisms

Let me now explain some of Sorabji's criticisms and indicate why I think they are mistaken.[4]

Sorabji's First Criticism

In discussing problems with the traversal argument, Sorabji criticises a possible source of resistance to the idea that past time might be infinite. He argues that "[O]ne source of resistance may be the idea that if an infinity of days had to pass before the arrival of today, then today would never arrive. This would certainly be so, if there were a first day, and then an infinity of days to cram in before today. But of course no first day is envisaged by those who postulate a beginningless universe, so there is ample room for a preceding infinity (Sorabji, 2010b:216)."

It seems from the context of his remark that Sorabji's intends to criticise what he suspects is Philoponus' underlying assumption in the traversal argument. He suspects that the traversal argument is a type 1 argument — that Philoponus is arguing that the very postulate of an infinity of time units before today is incoherent because it involves the assumption that past time is infinite but began. Sorabji assumes that because an infinity of items is logically compatible with there being no first item, that Philoponus is making a logical error. However, as we have seen, Philoponus' argument is a type 2 argument. Philoponus is not making a purely logical claim. He relies on the assumption that the A theory of time is true and other assumptions. This means that Sorabji's argument is question-begging. In any case, Philoponus is clearly aware that an infinite series can have no first member. Indeed, he uses that very point in a further argument against an infinite past time. To understand this, let us look at an argument in the Arabic paraphrase of Philoponus' commentary on Aristotle's *Physics* 5–8.

Philoponus there argues that certain infinite series cannot exist because they cannot start. The reason is that "[A]n infinite series has no first term, so the series of causes of this generation does not have a first term, and as a first term does not exist, the following terms do not exist either. On the strength of these assumptions simple generation would not exist, and there would be no generation of things. ... As an example of this argument one may refute the claim that Socrates has an infinite

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[4] Sorabji informs me that he only intended his second criticism to be directed at Philoponus. His criticisms were directed primarily at modern advocates of traversal arguments. However, in his paper, his other criticisms are directed at the traversal argument as such.

number of ancestors, because the infinite has no first term, and when the first one does not exist the following ones cannot exist either" (Lettinck, 1994:38). As Lettinck points out, the argument is intended to bolster Philoponus' case that past time cannot be infinite.[5]

Let us assume premises 1 to 5 of the reconstructed traversal argument are underlying assumptions of the argument in the previous paragraph. Applied to time, the argument is saying that an infinite past time is impossible because an infinite series of past time units could not have come into existence as it would have no first member. The subsequent members of the series could not have come into existence, as a pre-condition of their existence is that the preceding members of the series exist before they exist. An infinite past time is not consistent with the A theory of time plus Philoponus' additional assumptions.

The reader should note that if the B theory of time is true, the argument in the previous two paragraphs seems not to be a good argument about time. A time series laid out eternally might have no first member as the later parts of the time series are not ontologically dependent on the earlier parts of it coming into existence first. (Of course, each later member of a B series might be ontologically dependent on there always being a member that precedes it in the series. However, that would not prevent the series from being infinite.) Remember that Philoponus does not think that the traversal argument rules out a simultaneously existing infinity. Had he been aware of the B theory of time, he might have put his argument as an argument solely about A theory time.

Sorabji's Second Criticism

Consider the following remark by Philoponus: "If then, someone were to say that it is possible to take the unlimited (apeiron) in both directions, he says nothing other than that an unlimited number can come to be in actuality. For, as one regresses from the present year to the previous one, I find that an unlimited number has come to pass in actuality.

And yet it is impossible, not only for us, but for nature, to traverse an unlimited number; for the unlimited is untraversable by its own nature" (Philoponus, 1994:129–130). Sorabji's second criticism seems to be directed against this point even though he doesn't list it in footnotes. Here is Sorabji's criticism:

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[5] Lettinck, 1994:11–12. Lettinck seems to misunderstand the argument. He describes it as if it were the traversal argument. However, as I understand it, it is a separate argument. It is an argument that there cannot be an infinite series of past time units because there is no first member of an infinity and so the infinite series could not start (given the A theory of time). Philoponus presents a similar argument in his commentary on Aristotle's *On Coming to Be and Perishing*. He there also shows a clear awareness that infinite series have no first member and says "...it is generally impossible that anything could have come to be in the infinity". In addition, he mentions the impossibility of traversal (Vitelli, 1897:304; Kupreeva, 2005:99).

The first mistaken objection is related to a second one about counting. We might try to imagine that the years had already been subjected to counting, as they arrived. If the universe had no beginning, then earlier than any year we care to name, the count should have already reached infinity. But, the objection goes, it is absurd to suppose that this infinite count could be completed. What this objection overlooks is that counting differs from traversing in a crucial respect, for counting involves taking a *starting* number. ... But now I must face an objection. If the only obstacle to completing an infinite count is that conventional counting takes a *starting* number, what about counting in a backwards direction? Ought it not to be possible for a beginningless being to count off the years descending from a higher numbers and finishing with... zero? If this is not possible, then how can an infinity of years be possible?

My answer to this is that something like the backwards count would indeed be possible *in principle* ... it is conceptually possible that God should have included a beginningless meter in his beginningless universe to record how many years remained until some important event, say until the incarnation of his son... At zero BC the meter would register zero, but the counting would never have begun. Rather, for every earlier year, the meter would have displayed a higher number. Whether or not this should be called *counting*, there is no logical barrier to it, I believe: and therefore no logical barrier has been exhibited to the traversal of an infinity of past years. (Sorabji, 2010b:216–217)

"Traversal" may or may not be the right metaphor for what Philoponus wants to say. However, Sorabji's response misses Philoponus' point. Counting does involve a starting number and if Philoponus is right about the nature of time, it is hard to see how we can avoid the conclusion that time must have had a starting unit. In that case, the units would be countable from the first unit onwards, as Philoponus says. Sorabji's conceptual claim about traversal misses the fact that Philoponus relies on a theory about the nature of time. It is thus irrelevant to Philoponus' argument.

Sorabji's response to the objection which starts with "[B]ut now I must face an objection..." would not work against Philoponus; for what it describes is possible only if the B theory of time is true. In any case, the argument is question begging, for he assumes that Philoponus is arguing merely logically. Sorabji makes this explicit when he says in response to the objection that "no logical barrier has been exhibited to the traversal of an infinity of past years". However, as we have seen Philoponus' argument is not merely logical — it relies on a theory about the nature of time — it is a type 2 argument.

Sorabji's Further Criticism

I will skip discussion of some of Sorabji's minor criticisms due to lack of space. Sorabji argues in a further criticism, directed primarily at modern advocates of the traversal argument, that assuming an infinite past does not involve any event an infinite time ago. He then comments that "I think that failure to appreciate the nature and extent of the disanalogy between past and future series of traversed years has provided one motive for the view ... that an infinite past would involve events infinitely far removed from the present. Admittedly, a *future* set of years which started from now would

become actually infinite only if, *per impossible*, it attained to a year that was infinitely far removed. But the same ought not to be said about the *past*." (Sorabji, 2010b:218).

I have already pointed out that Philoponus is well aware that an infinite past does not involve a first event that occurred an infinite time ago. Merely repeating the explanation of the nature of an infinite past in response to Philoponus' supporters is begging the question against Philoponus' type 2 argument. Let me, however, pursue Sorabji's argument further.

Let me start by pointing out that the claim that there is a disanalogy between the past and the future is not correct if the B theory of time is true. If that theory of time is true, then, if an infinity of co-present units is possible, an actually infinite future time is also possible. Whatever is true of the past is true of the future. Without taking up the metaphysics of time, Sorabji is not entitled to make a claim about the disanalogy between the past and the future. Despite this problem, Sorabji might be able to rely on Philoponus' own view to criticise him. Philoponus seems to hold that once a time unit has come into existence, it is added to time. So perhaps it might be thought that Sorabji's criticism is warranted as an ad hominem criticism. The past is perhaps a kind of B series for Philoponus. In response, I do not think that Philoponus' view is correctly described as a B theory of the past. Philoponus at best treats past time units as a B series only when they are past. As an A theorist, he thinks that they can only become part of the past when they have come into existence. We have seen in earlier discussion that they can only come into existence after their predecessors have come into existence. So the past cannot have existed eternally if Philoponus is right (see my reconstruction of Philoponus' argument).

Conclusion

We have seen that Philoponus' traversal argument crucially relies on a theory about the nature of time. As Sorabji does not take account of this, at least three of his criticisms of the traversal argument fail. I hope to show elsewhere that his other criticisms of the traversal argument fail for similar reasons. Does this mean that time must have had a beginning? To deal with this question we would have to discuss the merits of the A theory of time and of other assumptions. There is no space for that here. However, let me draw a lesson from my discussion. Philosophers often assume that with some purely logical or mathematical remarks that they can rebut important metaphysical arguments. In fact, as Aristotle pointed out long ago, in using logic or mathematics as if it applied to the world without qualification, they often forget that it abstracts from important features of the world. Here I want to argue that misleading abstraction has led to confusion in discussing whether an infinite past time is possible. Sorabji talks about past time as if it has always existed in a Platonic world of the forms that renders its specifically temporal features irrelevant. By abstracting from the fact that time seems to have come into existence in successive units, he implicitly assumes that the B theory of time must have always been true of the past. This is why he thinks

that an infinite past time is possible. Yet the B theory of time is not a logical truth. To decide whether it is true and whether an infinite past time is possible, we need to engage in metaphysical argument.

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