

Infinite regress arguments for a first mover

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The Foundationalist Paradigm

It is almost a platitude that inquiry aims at discovering what the world is fundamentally like. This idea seems to presuppose that there is a fundamental level of reality – a presupposition that shapes what sort of questions are being asked, but which typically goes unchallenged.

On the face of it, there are two different ways in which foundationalism could turn out to be wrong. First, there might be an infinite sequence of ever lower levels; and second, the grounding structure might resist stratification into levels altogether, because there are circles of grounding. The project will explore both these options.

The view that there is an infinite sequence of ever lower levels, without an endpoint, is sometimes more colourfully expressed by the slogan there are “turtles all the way down” – deriving from a mytheme, a variant of which is represented in the following anecdote:

A well-known scientist (some say it was Bertrand Russell) once gave a public lecture on astronomy. He described how the earth orbits around the sun and how the sun, in turn, orbits around the center of a vast collection of stars called our galaxy. At the end of the lecture, a little old lady at the back of the room got up and said: “What you have told us is rubbish. The world is really a flat plate supported on the back of a giant tortoise.” The scientist gave a superior smile before replying, “What is the tortoise standing on.” “You’re very clever, young man, very clever,” said the old lady. “But it’s turtles all the way down!” ([Hawking 1988](#): 3)

The view that there is no fundamental level has its attractions. It may even be seen as suggested by modern physics (cf. e.g. Nobel Prize winner Hans Dehmelt’s [1989](#): 8618), via the following quasi-inductive argument: atoms turned out to have protons, neutrons and electrons as parts; protons and neutrons turned out to have quarks as parts, and ...?

Yet the coherence of the very idea of bottomless reality has repeatedly been questioned. It is a premise of many versions of the cosmological argument for the existence of God that there cannot be an infinite regress of explanation (cf. [Oppy \(2013\)](#) for an overview). Jonathan Schaffer coined the memorable phrase that if grounding or explanation were to go back infinitely, “being would be infinitely deferred, but never achieved” ([2010](#): 62). While such dismissal is widely shared, both in the theological tradition and in the contemporary philosophical debate, the arguments that support it have remained elusive.

Our (rejected) SINERGIA project “Being Without Foundations” questions the foundationalist paradigm and explores the consequences of its rejection. Two apparent possibilities need to find some space in our conceptual scheme. Even if they are ultimately ruled out, they are not obviously impossible and it would still be true that we need a much clearer conception than we presently have of exactly why they are impossible.

At least *prima facie*, there might be infinitely descending chains of relations of grounding, foundation, explanation, determination, dependence and causation. Physical space provides an instructive analogy. Perhaps motivated by an equally dogmatic rejection of the Aristotelian dogma that no line (or n -dimensional entity) can be composed out of or constituted by points (or $(n-1)$ -dimensional entities) – because (!) nothing can come out of nothing – modern philosophers, until almost the end of the last century, have almost universally assumed that spatial regions have an atomistic mereology, i.e. that spatial (or spatio-temporal) regions are ultimately composed out of points. This ‘pointy’ conception of physical space may be contrasted with a ‘gunky’ conception, according to which every extended region has equally extended proper subregions – hence we have ‘regions all the way down’. It has now been almost universally realised that there are no *a priori* reasons to exclude the gunkiness of physical space. Indeed, it is a respectable scientific hypothesis (Bohm (1957: 139) and Weinberg (1992: 230–240)), and philosophers now standardly assume that what they say about space should be compatible with its gunkiness.¹

We hold that the same is true more generally of the space of explanations, or space of reasons. Barring further argument, there is nothing problematic in principle with unbounded explanatory chains.

The other hypothesis that needs to be taken much more seriously than it presently is concerns ineliminable circularity. Such circularity has been widely studied in the philosophy of logic and mathematics, in connection with Russell’s paradox, but also in the philosophy of language, often in connection with self-reference,² but circular grounding or dependence may well be a live possibility for physics and metaphysics as well. Kerry McKenzie’s work on the so-called “particle democracy” in 1960s physical theory shows that symmetric grounding among elementary particles was once taken not only to be conceptually, but even physically possible (2011; forthcoming). More abstractly, the desire to preserve irreflexivity (and, given transitivity, to avoid circles of ground), imposes severe constraints on the individuation of the relata of the grounding relation. In order to count, e.g., the fact that p as a ground for the facts that $p \wedge p$ and that $p \vee p$, we have to distinguish these facts – which in turn seems to make sense only on a conception of ‘conceptual’, not of ‘worldly’ grounding (cf. Correia (2010, 2014, 2015, 2016) and Correia & Schnieder (2012: 18) for this distinction). So perhaps it is time to question the starting assumption, that explanation never goes in circles.

Miller’s Argument

Barry Miller (1982, cf. also his 1992: 96–113, where the argument is included under the heading “Why existence? The *ultimate* answer”). Miller allows that a series of causes can stretch back indefinitely, but he thinks that one particular kind of series needs to terminate: a series where the cause is “unfolded” into further causes on which it depends. So it may be true that a is caused by b , and that a is caused by (b insofar as b is caused by c), and that a is caused by (b insofar as b is caused by (c insofar as c is caused by d)), and so on. Such a series, Miller argues, has to terminate, because we would otherwise have what he calls an “open sentence”.

Aristotle on mediate motion

Physics VIII.5 argues that there is a first mover and that it is unmoved, by way of a number of regress arguments.

The first regress argument reduces indirect to direct transmission of motion. Motion is transmitted indirectly from a to b if a moves b by moving something else, c ; c may move b also indirectly, by moving d , etc. In this progression, we have a relation of priority: while a could be moving b in some other way, c would

1. Cf. e.g. Sider (1993), Hawthorne & Weatherson (2004), Nolan (2004), Arntzenius (2008, 2012), Arntzenius & Hawthorne (2005), Russell (2008), Schaffer (2010: 61–65), Dorr (2011: 156), Giberman (2012), Tallant (2013: 431), Sider (2013: 270), Cotnoir (2013), Leonard (2015).

2. Cf. e.g. Prior (1963), Spade (1974), Smoryński (1981), Bartlett & Suber (1987), McLarty (1993), Priest (1994), Smullyan (1994), Cantini (1997), Grattan-Guinness (1998), Brendel (2007), Heck (2007), Bolander (2013) for very different overviews.

not be moving b if it were not the thing by which a moves b .³ It is also a regressive progression: b may be said to be moved by d (the thing by which it is moved by c), and by c (the thing by which it is moved by a), but ultimately it must also be moved by a first member in the series, a . If there were no first member, it would not be moved by any of the intermediate members, for all they do is to transmit the motion they received from the original source of the movement.

In cases where motion is transmitted indirectly, the transmitting elements must themselves be moved, and indirect transmission must ultimately reduce to direct transmission: something moving something by itself. Aristotle presents a second version of this argument, focussing on the attribution of the moving: to attribute b 's movement to a (and not just to d and c), we have to reach back from b , via d and c , to a . If the series of intermediate causes were infinite, we would not be able to do this and never reach a , i.e. never be able to attribute the movement of b to a .

Aristotle adds a second argument: transmitted motion is contingent, so if every motion were transmitted, every motion were contingent, so it would be possible that there is no motion, which it is not:

εἰ γὰρ ὑπὸ κινουμένου κινεῖται τὸ κινούμενον πᾶν, ἤτοι τοῦτο ὑπάρχει τοῖς πράγμασιν κατὰ συμβεβηχός, ὥστε κινεῖν μὲν κινούμενον, οὐ μέντοι διὰ τὸ κινεῖσθαι αὐτό, ἢ οὐ, ἀλλὰ καθ' αὐτό. πρῶτον μὲν οὖν εἰ κατὰ συμβεβηχός, οὐκ ἀνάγκη κινεῖσθαι τὸ κινουόν. εἰ δὲ τοῦτο, δῆλον ὡς ἐνδέχεται ποτε μὴδὲν κινεῖσθαι τῶν ὄντων· οὐ γὰρ ἀναγκαῖον τὸ συμβεβηχός, ἀλλ' ἐνδεχόμενον μὴ εἶναι. ἐὰν οὖν θῶμεν τὸ δυνατόν εἶναι, οὐδὲν ἀδύνατον συμβήσεται, ψευδὸς δ' ἴσως. ἀλλὰ τὸ κίνησιν μὴ εἶναι ἀδύνατον δέδεικται γὰρ πρότερον ὅτι ἀνάγκη κίνησιν αἰεεὶ εἶναι. (256b4-13)

If everything that is in motion is moved by something that is in motion, either this is an accidental attribute of the things (so that each of them moves something while being itself in motion, but not because it is itself in motion) or it belongs to them in their own right. If, then, it is an accidental attribute, it is not necessary that that which causes motion should be in motion; and if this is so it is clear that there may be a time when nothing that exists is in motion, since the accidental is not necessary but contingent. Now if we assume something possible, nothing impossible will follow (though something false may). But the non-existence of motion is an impossibility; for we have shown above that there must always be motion. (Aristotle 2014: 940)

If everything that is moved, is moved by a moved, either this attribute belongs to things incidentally, so that what is moved causes motion – not, however, because it itself is moved – or it does not belong to them incidentally but intrinsically. In the first case, if the mover is moved incidentally, it was not necessary for it to be moved. But if so, clearly it is possible that at some time no entity is in motion. For the incidental attribute is not necessary but contingent. Thus, if we assume what is possible, nothing impossible will result, although a falsehood may. But for there to be no motion is impossible. For it has been proved earlier that motion is impossible. (Aristotele 1999: 13)

The argument may be laid out as follows:

A Suppose every thing that is moved is moved by something else that is moved.

P1 Being moved by something else that is moved ($= F$) is a property had either incidentally (*kata sumbebēkos*) or intrinsically (*kath'auto*).

P2 If F is had incidentally, it is had contingently (not necessarily: *ouk anagkē*).

P3 If F is always had contingently, it is possible that it could not be had at all.

P4 If it is possible that F is not had at all, it is possible that there is no motion.

P5 It is not possible that there is no motion.

C Hence our supposition is false: there is a thing that is moved but not moved by something else that is moved, but rather either moved by something self-moved or by something unmoved.

Aristotle's explication of (**P2**) is very interesting. If an attribute (e.g. F) belongs to some thing incidentally, he says, “what is moved causes motion – not, however, because it itself is moved” (256b6-7). Some thing, a , would thus have F by coincidence iff (i) a is moved by b , (ii) b is moved but it is not the case that (i) because (ii), but (i) has some other explanation: (i) because of some fact involving some other thing. But in this case

3. I interpret 256a10-11 thus as being concerned with essential dependencies between movings, rather than some general ontological dependence in the way Graham (1999) does.

there is no link between (ii) and (i) and they could, at least in principle, fail to co-obtain: (i) could be the case even if it were not the case that (ii), in which case we had no assurance that F is had by a .

The crucial premise, of course, is (**P3**), the step from distributive contingency (for any x , it is possible that it is G) to collective contingency (it is possible that for all x , Gx). This is clearly not a logical step,⁴ so it is in need of an argument which Aristotle unfortunately does not provide.

In addition, (**P4**) is quite questionable: if nothing is such that it is moved by something else that is moved, then either (i) nothing moves or (ii) everything that moves is either unmoved or moved by something that is not moved. Why should, under the possibility operator, (ii) collapse under (i), i.e. why should we be able to conclude from the possibility of (either (i) or (ii)) the possibility of (ii)?

The third argument is introduced by a tripartite distinction between the mover, the moved and the means: the mover moves, but is perhaps not moved; the means transmits motion, moves and is moved; the moved is moved, but does perhaps not move. With respect to this distinction, Aristotle claims that the transmission of motion must originate in something that is – at least under a certain aspect – not itself in motion:

τὸ δὲ κινεῖν οὕτως ὥστ' εἶναι μὴ ᾧ κινεῖ, ἀκίνητον. ἐπεὶ δ' ὁρῶμεν τὸ ἔσχατον, ὃ κινεῖσθαι μὲν δύναται, κινήσεως δ' ἀρχὴν οὐκ ἔχει, καὶ ὃ κινεῖται μὲν, οὐχ ὑπ' ἄλλου δὲ ἀλλ' ὑφ' αὐτοῦ, εὐλογον, ἵνα μὴ ἀναγκαῖον εἴπωμεν, καὶ τὸ τρίτον εἶναι ὃ κινεῖ ἀκίνητον ὄν. (256b20-24)

...and the mover – that is to say, that which causes motion in such a manner that it is not merely the instrument of motion – must be unmoved. Now we see the last things, which have the capacity of being in motion, but do not contain a motive principle, and also things which are in motion but are moved by themselves and not by anything else: it is reasonable, therefore, not to say necessary, to suppose the existence of the third term also, that which causes motion but is itself unmoved. (Aristotle 2014: 941)

But the mover, in so far as it is not the means, is unmoved. When we observe the last moved, which is able to be moved but does not have its own source of motion, and what is moved, not by another but by itself, it is reasonable, not to say necessary, to suppose that there is a third thing which causes motion while being unmoved. (Aristotele 1999: 14)

This is a quasi-conceptual argument: distinguishing, as we can, among the things at least partly responsible for some motion between those that are themselves moving and those that are not, we characterise those of the first class as ‘means’ or ‘instruments’, vehicles through which the motion is imparted. It then appears very plausible to suppose that not everything responsible for the motion can be of this kind, i.e. that the second class cannot be empty: something must originate and not just transmit the motion.

As in the previous regress, we start with something which is moved and moving by itself, not accidentally. We then look at the chain of its moving movers (its F -chain, in the terminology from before) and conclude (because there cannot be an infinite F -regress) that it has a last member. This last member, because it is a member of the chain, has a mover; but because it is the last member, this mover does not belong to the chain, i.e. is not itself moved.

Perhaps unsure of the soundness of the first three, Aristotle produces yet two other arguments to show that there is a first (i.e. unmoved or self-moving) mover. The first one addresses the regress of movers directly, arguing that, because there is only a finite number of types of motion and because moving is transitive, every agent of a motion of type F will itself be a patient of a motion of the same type F , which is said to be impossible. But it clearly is not: far from being “absurd” (*alogon*) and “impossible” (*adunaton*), it is quite often actually the case that the teacher is learning (I hope it is the case in our very own situation). This is why Aristotle says that “one must carry to the individual cases”, i.e. consider the regress not with respect to teaching but with respect to, e.g., teaching-that- p , not with respect to throwing but with respect to, e.g.,

4. Though perhaps Aristotle regards it as such.

throwing in a certain manner. If we do this, however, I see no reason to grant Aristotle the assumption that (even by his own lights) the number of *these infima species* of motion is finite.⁵

The fifth argument considers a regress not of movers, but of movables. “The movable” / “*to kinēton*” in English as in Greek is ambiguous between “what can move” and “what can be moved”. The fifth argument, however, does not really concern the existence of a first mover. Taken as such an argument, it simply asserts and does not argue that if we individuate the ways of being movable finely enough, it will be absurd that whatever is potentially an agent of a certain type of motion, necessarily is also potentially a patient of it.

The ambiguity is much more relevant for the next step in the overall-argument, which, “making another beginning”, is to ask in what sense self-moving is possible. The claim with respect to the ambiguity of “movable” is that nothing can be ‘it’s own’ movable in both senses of that word, i.e. be agent and patient of the very same process of moving. The overall conclusion will then be that the first mover is intrinsically such that it moves, that it itself is unmoved and that it does not move its parts.

Aristotle starts by recalling the earlier claim that everything that is moved is continuous, i.e. “is divisible into parts that are at every stage divisible”. If something moved is moved by itself, it thus must have parts. In order to show that a thing, as a whole, cannot move all its parts conjunctively, Aristotle gives a better argument for the irreflexivity of the infima species of motion, i.e. that e.g. nothing can teach and learn the same thing by the same process:

ἔτι διώρισται ὅτι κινεῖται τὸ κινητὸν τοῦτο δ' ἐστὶν δυνάμει κινούμενον, οὐκ ἐντελεχείᾳ, τὸ δὲ δυνάμει εἰς ἐντελέχειαν βαδίζει, ἔστιν δ' ἡ κίνησις ἐντελέχεια κινήτου ἀτελής. τὸ δὲ κινεῖν ἤδη ἐνεργεῖα ἔστιν, οἷον θερμαίνει τὸ θερμὸν καὶ ὄλως γεννᾷ τὸ ἔχον τὸ εἶδος. ὡσθ' ἅμα τὸ αὐτὸ κατὰ τὸ αὐτὸ θερμὸν ἔσται καὶ οὐ θερμὸν. ὁμοίως δὲ καὶ τῶν ἄλλων ἕκαστον, ὅσων τὸ κινεῖν ἀνάγκη ἔχειν τὸ συνώνυμον. τὸ μὲν ἄρα κινεῖ τὸ δὲ κινεῖται τοῦ αὐτοῦ αὐτὸ κινουντος. (257b6-14)

Moreover, we have established the fact that it is the movable that is moved; and this moves potentially, not in fulfilment, and the potential is in process to fulfilment, and motion is an incomplete fulfilment of the movable. The mover on the other hand is already in actuality: e.g. it is that which is hot that produces heat, and in general that which produces the form possesses it. Consequently, the same thing in respect of the same thing will be at the same time both hot and not hot. So, too, in every other case where the mover must have the synonymous property. Therefore when a thing moves itself it is one part of it that is the mover and another part that is moved. (Aristotle 2014: 944)

Further, we have explained that the movable is what is in motion; but it is in motion through potentiality, not through actuality, and the potential is in process to realization, and motion is the incomplete realization of the movable. But the mover is already actual – for instance, the hot heats, and in general what has the form produces it in others. So the same thing will be hot and not hot at the same time in the same respect, and likewise with everything else in which the mover must have the same name as the moved. Therefore one part of the self-mover causes motion, and one part is moved. (Aristotle 1999: 15–16)

That this argument is supposed to be conclusive is shown by the invocation of the law of non-self-contradiction. The contradiction is supposed to arise from the supposition that the very same thing moves itself, is a movable in both senses of potentially being moved by itself and actually moving itself. Motion, it is recalled, is the actualisation of the potentiality *as a potentiality*, so it is *as movable* that the movable is moved; to be the efficient cause of such moving, it must also be moving *as actually movable*. In the first, passive sense of “movable” (being potentially moved), the actualisation must not yet have been completed (for otherwise the thing would not be being moved, but rather having been moved); in the second, active sense of “movable” (potentially moving something), the actualisation (of the power to move) must have been completed (for without actualisation of the its power to move, the thing would not be moving anything). The very same potentiality, therefore, must and cannot be completely actualised, which is a contradiction.

5. Indeed, there will necessarily be an infinity of them, at least if velocities are counted among the ‘manners of locomotion’.

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