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Does Berkeley's Immaterialism Support Toland's Spinozism? The Posidonian Argument and the Eleventh Objection

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Abstract
This paper argues that a debate between Toland and Clarke is the intellectual context to help understand the motive behind the critic and the significance of Berkeley's response to the critic in PHK 60-66. These, in turn, are responding to Boyle's adaptation of a neglected design argument by Cicero. The paper shows that there is an intimate connection between these claims of natural science and a once famous design argument. In particular, that in the early modern period the connection between the scientific revolution and a certain commitment to final causes, and god's design, is more than merely contingent. The details of PHK 60-66 support the idea that the critic is responding to concerns that by echoing features of Toland's argument Berkeley undermines the Newtonian edifice Clarke has constructed.

1 Introduction

In this paper I return to a brief exchange in the 1980s between two influential scholars, Daniel Garber[1] and Margaret Dauer Wilson[2] over the implications of Berkeley's handling of the eleventh objection at *Principles of Human Knowledge* (PHK), 60-66.[3] While the exchange has attracted some modest attention,[4] the import of the question they were debating, namely what exactly is at stake in Berkeley's response to the hypothetical critic in *Principles* 60-66, has eluded full clarification. This hypothetical critic argues that Berkeley's immaterialism makes the hidden parts of nature and the hidden organs of

[1] See Garber (1982).
[2] See Wilson (1985/1999). My references are to the page numbers in the 1999 reprint.
[3] All references to Berkeley are to Luce & Jessop's edition of *The Works of George Berkeley, Bishop of Cloyne*, 9 vols. (London: Thomas Nelson & Sons, 1948–1957). I have used the following abbreviation: *Part I of A Treatise concerning the Principles of Human Knowledge* (*Works*, vol. 2), section x = PHK x.
[4] See Downing (2005).

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plants and animals dispensable:[5] 'why does not an empty case serve as well as another?' (PHK, 60; in context Berkeley is using the clockwork metaphor to talk about nature). The critic worries that the hidden structure of nature and its organisms becomes vacuous. The question I wish to answer is, why care about that?

The main point of my paper is that a debate between Toland and Clarke is the immediate intellectual context to help understand the motive behind the critic and the significance of Berkeley's response to the critic in PHK 60-66. These, in turn, are responding to Boyle's adaptation of a neglected design argument by Cicero.[6] I end up siding with Garber for reasons distinct from his.[7] So, while I do not disagree with the now standard interpretation that this critic expresses 'the rival claims of corpuscularian science' (Atherton 2020, p. 79), I argue that this understates what is at stake. For, the critic does not limit herself to corpuscularian science. For, I show, there is an intimate connection between these claims of natural science[8] and a once famous design argument.

In particular, I show how in the early modern period the connection between the scientific revolution and a certain commitment to final causes, and god's design, is more than merely contingent.[9]

I first briefly discuss PHK 60-66 and the competing interpretations by Garber and Dauer Wilson. I agree with Winkler (1989) and Atherton (2020) that providence seems crucial to the argument, but they fail to explain fully what would have motivated the critic. In the third section, I introduce a neglected design argument presented in a

[5] See Winkler (1989, p. 265).

[6] But see Hunter (2009, pp. 235–45); Schliesser, (2017, 281ff). My discussion below deviates a bit from Hunter and my own earlier treatment.

[7] This way of construing my argument originates a paper given in his honor at Garberfest in September 2014 at Princeton. This paper has benefitted greatly from the audience comments. In addition, the paper was presented at conferences at York (in honor of Catherine Wilson) and Dublin in 2019. I am grateful to comments by learned audiences in all these venues as well as to Daniel Moerner, René Brouwer, and the editors of this volume on earlier drafts.

[8] Using 'science' without warning is a bit anachronistic. As it happens most of my own use of 'science' involve examples from and discussions about observational, geometric, physical astronomy (which has always been thought a science), so if one wishes one can substitute 'astronomy' or, when appropriate, 'natural philosophy' whenever I use 'science'.

[9] On the significance of final causes in early modern science, see Osler (1996). My argument explains why this is so.

once prominent place in Cicero and I offer some natural reconstructions of it. In section 4, I show how Boyle used this argument. In section 5 I focus on Toland in order to set up the crucial section on Clarke (section 6), and the way in which the argument figures in a controversy between Clarke and Toland. In section 7, I return to Berkeley and show how the details of PHK 60-66 support the idea that he is responding to concerns that by echoing features of Toland's argument he undermines the Newtonian edifice Clarke has constructed.

2 The Garber-Dauer Wilson Debate

In his 1982 article, Garber concluded that:

> never once in the course of [Berkeley's] lengthy response [to a hypothetical critic in PHK 60-66] does he suggest that the objects in question do not really have internal parts. Berkeley takes it for granted that they do and attempts to explain why God may have made things in the way in which he did.…there is no suggestion that the mechanisms that Berkeley is talking about are any less real than tables or chairs. The mechanisms that must exist are not presented as fictional, instrumental things, terms in a mathematical theory of nature that have no significance outside of that theory, a status that he explicitly gives forces and attractions…It seems clear that Berkeley meant to include the hidden corpuscular substructure of things as well. (Garber, 1982, pp. 182–184)

In Quine-ean terms one may say that on Garber's reading that in Berkeley's philosophy the visible and the indispensable, hidden qualities of things have ontological parity.[10] By contrast Margaret Dauer Wilson denies that Berkeley accepts imperceptible or insensible corpuscles (even if they are ideational) or the reality of hidden mechanical structure. For, in the intellectual culture of the mechanical philosophy corpuscles are by definition insensible so there is no reason why he would have to accept these into his ontology.[11]

While both Garber and Wilson draw on many of Berkeley's texts, the underlying debate seems to turn on to what degree Berkeley's response to his hypothetical critic expresses his own all things

[10] On the significance of indispensability arguments in Berkeley, see Schliesser (2005, p. 45).

[11] I pretend here that the claims about hidden corpuscles and hidden mechanisms are on par. But, of course, the latter are not by definition insensible.

considered views (as Garber contends) or accepts premises only for the sake of argument to refute this kind of critic (as Dauer Wilson contends). As Winkler notes PHK 60-66 has 'a complex structure' (1989, p. 265). So, it is no surprise that part of Dauer Wilson's charge against Garber is that he 'overreads' the passage.[12]

In refuting Dauer Wilson's criticism,[13] Winkler usefully points out that the central issue in the response to the hypothetical critics in Principles 60-66 is not one of ontology, but with the complexity hidden behind the visible world – a complexity that seems unnecessary on a natural reading of Berkeley's principles. In Winkler's terms, the critic 'wants the immaterialist to explain why "God should make us, upon a close *inspection* into his works, *behold* so great variety of *idea*s, so artfully laid together"' (Winkler, 1989, p. 268, quoting PHK 64, emphasis in Winkler). Winkler recognizes the real issue here is the question of God's providence (1989, p. 275). But given that Berkeley endorses God's providence, Winkler does not explain why the hypothetical critic could have been worried about the drift of Berkeley's immaterialism. Berkeley reports the objection as, 'how upon our principles, any tolerable account can be given, or any final cause assigned of an innumerable multitude of bodies and machines, framed with the most exquisite art, which in the common philosophy have very apposite uses assigned them, and serve to explain abundance of phenomena?' (PHK, 60). So, the critic is both interested in how on Berkeley's account the diversity of phenomena can be explained and how final causes are assigned. Crucially for my present purposes the critic intimates a tight link between these two tasks in 'the common philosophy'.

In my contribution to the debate, I show that the hypothetical critic expresses a concern that touches on the status of an extremely important and once influential design argument. This argument had been adopted by quite diverse schools of natural philosophy in the period. And while Berkeley's immaterialism also provides support for a

[12] Downing, who sides with Dauer Wilson, concurs but softens it: 'thus I agree with Wilson that Garber overreads PHK 60-6 somewhat.'

[13] Atherton (2020, p. 81) also sides with Garber, but she thinks the point of Berkeley's 'reformulated…account of the order of nature' is to move 'from a causal account' (associated with the mechanical philosophy) 'into one in terms of signs and signifiers, ideas and their meanings. On such an account, the order of nature is explicitly for us, it is an order that exists through the understanding of creatures and requires, as Berkeley says, the "wisdom and beneficence" of the creator'. I agree with her, but I would emphasize, perhaps, even more than she would the significance of God's wisdom and beneficence to the argument.

distinct design argument, it does seem to undermine the more natural one embraced by the hypothetical critic, who, on my reading stands for the main current of the scientific culture of the age. On my proposed reading then, Berkeley really has no choice but to accept the premises that he needs in order to refute the hypothetical critic.

3 The Posidonian Argument

In this section, I introduce the once famous design argument transmitted, and perhaps invented by Cicero's *On the Nature of the Gods* (composed ca. 45BC).[14] In this section I offer two interpretations of this argument: (1) a prima facie interpretation; (2) a 'neglected' [15] one. In the subsequent section (4) I offer what I call (3) a 'transcendental interpretation', I show that it is very familiar to seventeenth and eighteenth centuries authors.

After discussing other kinds of design arguments, Cicero's Stoic character, Quintius Lucilius Balbus, says,

> But if all the parts of the universe have been so appointed that they could neither be better adapted for use nor be made more beautiful in appearance, we must investigate whether this is chance, or whether the condition of the world is such that it certainly could not cohere unless it were controlled by intelligence of divine providence. If, then, nature's attainments transcend those achieved by human design, and if human skill achieves nothing without the application of reason, we must grant that nature too is not devoid of reason. It can surely not be right to acknowledge as a work of art a statue or a painted picture, or to be convinced from distant observation of a ship's course that its progress is controlled by reason and human skill, or upon examination of the design of a sundial or a water-clock to appreciate that calculation of the time of day is made by skill and not by chance, yet none the less to consider that the universe is devoid of purpose and reason, though it embraces those very skills, and the craftsmen who wield them, and all else beside?
>
> Our friend Posidonius has recently fashioned a planetarium; each time it revolves, it makes the sun, moon, and planets reproduce the movements which they make over a day and a night in

[14] On the history of design arguments more generally, see, especially, Hurlbutt (1985), Manson (2003), Del Ratzsch & Jeffrey Koperski (2016).

[15] Inspired by Hunter (2009), op. cit.

> the heavens. Suppose someone carried this to Scythia or to Britain. Surely no one in those barbarous regions would doubt that that planetarium had been constructed by a rational process. Yet our opponents [the Epicureans] here profess uncertainty whether the universe, from which all things take their origin, has come into existence by chance or some necessity, or by divine reason and intelligence. Thus, they believe Archimedes more successful in his model of the heavenly revolutions than nature's production of these, even though nature's role is considerably more ingenious than such representations. (*On the Nature of the Gods*, 2.87-88)[16]

There are many arguments from design. Let's dub the main one articulated in the quoted passage by Balbus, the 'Posidonian argument'. It deploys – in David Sedley's felicitous phrase – the 'structural resemblance of state-of-the-art-planetary mechanism to the celestial globe.'[17] For, it relies, to simplify, on the supposition that everybody (even barbarians) will grant that if a sophisticated complex machine, which is a scientific representation of nature, is the product of intelligent design, then (once granted) it turns to suggest that the represented complex (beautiful, well-adapted, etc.) machine must itself also have an intelligent author.[18]

I stipulate that despite the presence of minor variants, we are dealing with the Posidonian argument when (i) a presentation of a design argument is accompanied (as it is in Cicero's text) by (ii) a reference or allusion to Archimedes' planetary sphere; (iii) a reference to Posidonius' portable planetarium (iv) and some uneducated foreigner (ignorant barbarian, savage, etc.).[19] If all four of these are present in

[16] Cicero, *The Nature of the Gods*, trans. P.G. Walsh Oxford: Oxford University Press, (1978, pp. 78); I have made some minor modifications. For the Latin after Cicero, *De natura deorum* 2 and 3, ed. A.S. Pease Cambridge MA.: Harvard University Press (1958), pp. 763–769.

[17] See Sedley (2007, p. 207).

[18] As Sedley notes the represented world need not be itself a mechanism (Sedley, 2007, p. 207).

[19] According to (Sedley 2007, p. 207, n. 6), Archimedes' sphere is 'likely to be the original Stoic example', and the naming of Posidonius' a 'localizing touch' (Posidonius was one of Cicero's teachers). In addition, see Kidd (1988, pp. 74–75). See also the useful discussion in Berryman (2010, pp. 150–55). Details on Archimedes' sphere can also be gleaned from (among others) Cicero (e.g., Republic 1.21-22; Tusculan Disputations 1.63), Sextus Empiricus, M. 9.115, and Proclus (A Commentary on the First Book of Euclid's Elements, Book I, Chapter XIII). (All available to early modern readers.) For more such references see: http://www.math.nyu.edu/~crorres/Archimedes/Sphere/SphereSources.html.

later texts we can be sure that the (original) source is Cicero. However, as I note below, there are variants of this design argument in which either (ii) or (iii) is dropped or different machines are used as examples. In these cases we may still be dealing with versions of the Posidonian argument (especially if Cicero is mentioned or knowledge of him can be presupposed). Of course, sometimes technical works on planetariums and astronomy (and their history), may note Cicero's mention of Posidonius' or Archimedes' planetarium without intending to offer a design argument (which is why (i) is necessary condition).[20]

Before I offer a modest reconstruction and evaluation of the argument,[21] I note a few features related to (i-iv). Balbus suggests that there are three ordering principles of the universe: chance, necessity, or intelligence.[22] The chance option is historically associated with the epicurean position, an identification that continued in subsequent history through the eighteenth century.[23] Sometimes I treat this option as synonymous with 'brute fact'. Berkeley sometimes uses 'blind chance' (PHK, 93; it's called 'blind' because of the denial of providence and final causes). The necessity option (which also denies final causes), I'll associate with Spinozism. Berkeley calls it 'fatalism' or 'fatal necessity' (PHK, 93). Thanks to Cudworth and Bayle, Strato became the ancient figure associated with the system of necessity in the early modern philosophy.[24] It is not altogether

[20] See, for example, this entry of Beeckman's diary in 1629: http://adcs.home.xs4all.nl/beeckman/IIIv/1629vhtml#105, or Huygens' description of his planetarium: http://dbnl.nl/tekst/huyg003oeuv21_01/huyg003oeuv21_01_0110.php?q=Posidonius (Huygens, 1944, p. 588).

[21] For a very careful and illuminating rational reconstruction of Cicero's argument, see Hunter (2009, pp. 235–45). Hunter's aim is to show how Cicero's argument is an instance of a 'non-trivial valid argument leading from the admission that certain artifacts require a designer to the conclusion that certain natural entities, or the natural world as a whole, also require one' (p. 236) Hunter thinks that in Cicero's version the 'reference to Archimedes is a mistake' (p. 239, n. 12), presumably by a scribe. I disagree with Hunter, but for my present argument this does not matter; sometimes early modern readers did bring the Posidonian argument and Archimedes' sphere together.

[22] Notice that I speak of 'ordering principle', because for a Stoic it would be unintelligible to allow that the universe could be caused by nothing. I return to this in the text when I discuss the role of the Principle of Sufficient Reason (PSR) in the argument.

[23] For evidence, see Schliesser (2013).

[24] The systems of Hylozoistic atheism (Cudworth's polemical description of Strato) and divine fate (Stoics) are run together in the wake of the Spinoza controversy. See Brooke (2006, 391ff).

unlikely that the system of necessity was associated with Stoicism itself in Cicero's day.[25] Finally, Balbus asserts that a divine mind is the final option. He clearly associates the products of a divine mind with a providential order. Often I'll simply use, following Berkeley, 'God' or 'the Intelligence that sustains and rules the ordinary course of things' (PHK, 62) to refer to this option. Without explanation, Balbus seems to think that chance, divine mind, and necessity exhaust the genuine possibilities.

If one takes Balbus' exposition at face value,[26] the argument relies on the analogy between the apparent beauty of the well-adapted, manufactured (etc.) machine and the beauty and well-adapted nature of the heavens to infer an intelligence behind the universe.[27] Moreover this argument may be read to rely on a further aesthetic premise, 'nature's attainments transcend those achieved by human design,'[28] and in conjunction with the empirical assertion that human craft produces nothing without reason and art to argue for the existence of a higher excellent intelligence behind nature's

[25] Divine fate works through an open-ended series of causes. While most Stoics insisted they believed in a providential order, it is no surprise that 'According to Epicurus, Letter to Menoeceus, preserved in Diogenes Laertius at 9.133 (LS 20A), the Stoic doctrine of fate would involve an "inexorable necessity"'. Quoted from Brouwer (2019, p. 36). See also Cicero, *De Divinatione* 1.125-126.

[26] For example, Lewis Ezra Hicks, quotes the same passage at length but without comment as an illustration of how Cicero anticipates modern arguments. Without analysis, he treats the argument as relying fundamentally on 'analogy' (Hicks, 1883, p. 64).

[27] Hunter nicely describes the 'logical motor' of 'standard' design arguments as follows: it 'motivates its conclusion with a "how much more so" question' (p. 236). Hunter does not attribute the standard version to the Ciceronian passage under discussion because he wishes to interpret the passage as exemplifying a 'new' argument. But the Ciceronian passage can plausibly be interpreted as articulating both the 'standard' as well as the 'new' arguments (as Hunter admits 'even the "how much more so" comparison of the standard version is not entirely absent' (p. 240)). Nothing hinges on my disagreement with Hunter here.

[28] One need not understand 'excellence' (*perfecta*) in strictly aesthetic terms. One can interpret it in terms of magnitude, size, or power (etc.). But this is not to deny the presence of aesthetic elements in Cicero's argument ('beautiful'). These aesthetic issues, especially in terms of the inhabitants of planets of other solar systems, matter a lot to Clarke and Newton (see the General Scholium to the *Principia*), but for present purposes this can be left aside.

order.[29] I do not foreground the significance of this analogy, but it is not irrelevant (cf. PHK, 106-109).

Posidonius was a famous Stoic philosopher active on Rhodes, where he was almost certainly met by Cicero.[30] It is very likely that Cicero encountered a portable planetarium designed by Posidonius. Neither Cicero nor Balbus explains what the function of the barbarian in the argument is. But I take it that it is meant to be the imagined judgment of untutored (because uncivilized) humanity, that is, a kind of lowest denominator judgment. If the thought experiment does its job – 'even a barbarian will consent to X' – then nobody can object to X. In the context of the Posidonian argument, it seems to entail that if a machine is of sufficient complexity and artificiality everybody will agree it is the product of highly rational design and artifice.[31]

Okay, with that in place, I offer a rational reconstruction of Balbus' argument. My reconstruction is not meant to be exhaustive (again I drop the role of analogy), but I intend for it to capture the gist of the implied argument and for it to be a valid argument.

1. All of nature's parts are ordered; they exhibit apparent design and beauty.
2. Artificial, complex machines are the product of rational design.
3. A planetarium is a complex machine or concrete representation of the heavens.
4. Nature's complexity is greater than the complexity of a planetarium.
5. Posidonius' planetarium is a successful representation of the heavens.
6. Even a barbarian will acknowledge that Posidonius' planetarium is a complex machine (when she is confronted by it)

[29] Jantzen (2014) treats Balbus' argument primarily as an argument by analogy. In the argument by analogy, nature (represented by the machine) is also a machine (or machine-like). Jantzen offers two more interpretations of Balbus' argument: in one it is assimilated to another argument for the improbability of order; in the other it is assimilated to a Socratic argument from purpose. Given the structure of Cicero's text it is indeed likely that the argument for the improbability of order is in the background of Balbus' exposition.

[30] Plutarch, (*Life of Cicero*) 4.5. They stayed in touch: for their later correspondence, see Cicero, (*Letters to Atticus*) 2.1.1. I thank René Brouwer.

[31] Presumably Cicero is trying to screen off debates over human artifacts that may seem imperfect in various ways.

7. So, even a barbarian, who correctly accepts premise (2), will acknowledge that Posidonius' planetarium is produced by rational design.
8. Nature's order is caused either by chance, or by necessity, or by a divine mind.
9. Nature's order is not caused by necessity or chance because it is impossible that something less complex can be the product of rational design while the more complex thing (i.e., nature) it represents is not.
10. For if you thought otherwise, then the designer of the less complex concrete model would be superior to the cause of the thing represented by the model (nature). That is, if nature's order has greater complexity than the clock and the clock is a product of design then so is nature's order.
11. Therefore, nature's order is caused by the divine mind's rational design.

Strictly speaking the conclusion does not require premises (2) through (7). But the particular appeal of this argument rests on these premises. The obvious weak spot in the argument is (8); Balbus assumes without argument that (8) is exhaustive. If it is not exhaustive, then the argument is obviously not sound. In addition, I have formulated (8) so as to take the *origin* of *nature* off the table. That's because due to the embrace of a version of the PSR – *ex nihilo nil fit* – for a Stoic, and most ancients,[32] nature must be caused. Obviously when we deal with a later, Christian context, the status of (8) and the acceptance of PSR which it presupposes, needs to be investigated.

The universal quantifier – 'all of nature's parts are ordered' – in premise (1) also seems rather strong.[33] In addition, even if one were

[32] Strictly speaking, the Stoics may not have embraced *ex nihilo nihil fit*, but they did embrace various causal principles that clearly rule out uncaused motion and, in some instances, un-caused existence. For very helpful discussion, see Bobzien (1998, section 1.3.3). Given their theology, it seems the question of the origin of cosmic existence does not quite arise in the crisp way it does for Lucretius or Aristotelian thinkers, and later Christians (see Bobzien, 1998, p. 412). Cicero's De *Divinatione* 1.125-126 is worth reading on fate. Cf. Lucretius on his principle at *De Rerum Natura*, 1.149-156. http://www.perseus.tufts.edu/hopper/text?doc=Lucr.+1.150&fromdoc=Perseus%3Atext%3A1999.02.0130, accessed 9 January, 2019. I thank Eric Brown for helpful discussion.

[33] In Newton's general scholium, one of the arguments from design also appeals to it: 'All that diversity of natural things which we find, suited to different times and places.'

to grant that all of nature is beautiful, not everybody will naturally agree with (1) – as Diderot would argue, defective animals (so called 'monsters') are born not infrequently.[34] This suggests that not all individual parts of nature are best adapted for use. How to think about (1) in light of such naturally occurring imperfections is no easy matter. There are ways to account for nearby versions of (1) in which some apparent imperfections turn out to be very beneficial in light of the overall beauty and aptness of the universe.[35] Even so, it is no surprise that modern presentations of so-called deductive, abductive, and inference to the best explanation design arguments tend to require only that 'some things in nature…exhibit exquisite complexity.'[36]

While (1) is characteristic of arguments *from* design, one may well wonder if (1) is really required in Balbus' version of the argument. For one can derive the conclusion (11) without it. That is to say, the real work in this reconstruction of the argument is not being done by the existence of apparent design (1), but by (a) the (partial) morphism between the concrete model and reality and (b) the relational complexity of model and reality (that is, (3), (4),(10)).[37] Versions of the argument that continue to appeal to (1), I'll treat as '*prima facie* versions of the Posidonian argument'. Versions of the Posidonian argument that drop (1), I'll call the 'neglected Posidonian argument'.[38]

Of course, some modern readers may also think that there is something fishy about (9–10). Surely, some artifices are better than their natural counterparts? One can grant that (perhaps easier now in age of precision tools), and still think that (9–10) can survive scrutiny. In fact, I would argue that Balbus' point here is a more subtle.[39] Even the very best concrete models of reality are imperfect because they must leave out or abstract away from some of the intricacy of nature. This point is basically stipulated in (4). This is not to deny that one can imagine successful concrete representations of nature where the concrete model is (say) unnecessarily more complex than nature (e.g., by adding an extra gear); but, leaving aside questions

[34] See Wolfe (2005, pp. 187–204).

[35] Leibniz is fond of such arguments.

[36] See Ratzch & Koperski (2016). Of course, if one is in the grip of the PSR, one may well wonder why it's only some parts that appear as designed.

[37] See Hunter (2009).

[38] In deference to the spirit of Hunter (2009). The details of his reconstruction different from mine.

[39] Again Hunter (2009) has done excellent work on this.

about to what degree such complexity must be functional and efficient, even *that* concrete model will leave out other bits of the machinery of nature or the phenomena it tracks. So, the stipulation (4) can be defended and survive scrutiny.

But that it is stipulated suggests that (9–10) may be dispensable. Here's a thought: premise (3) relies on the idea that the model inherits its features, or at least many of its significant ones, from reality *in virtue* of the effort in representing reality. That is to say, the particular complexity it has may be built by humans, but it is meant to track nature. The particular machine is built by humans, but – and this captures the intuition behind premise (10), the morphism it exhibits with reality is not original in the human designer, but extrinsic to it.[40]

Note that due to technological developments (2) can increasingly seem less plausible, if we insist that it is only humans can build artificial machines. Artificial machines that design and create other artificial machines (can) exist now.[41] It is conceivable, even likely, that in the fullness of time such artificially designed machines by other machines will prompt people, or even the machines themselves, to assert that 'such exquisitely crafted machines could never have been designed by feeble creatures like humans!'[42] Of course, as stated (2) makes no mention of humans (even if the implied referent may well be humans), and, in fact, the argument would work just as well if one were to think, as Paley suggests, of machines or robots engineering other machines.

I offer one final observation on the reconstruction of the prima facie argument. Premise (6) is a bit redundant if you accept premise (3). And premise (7) is redundant if you simply accept premise (2). In both cases a rhetorically arresting thought experiment is used to provide evidence for something one is likely to accept anyway. So, one may consider premises (6–7) dispensable.

So, to sum up the situation so far: the prima facie version of the Posidonian argument, which is an argument from design (and so contains (1)), contains within it – if we drop (1), (6), and (7) – a very clever argument for the existence of God. The 'neglected' Posidonian argument goes like this:

A. Artificial, complex machines are the product of rational design.

[40] Again, this idea is inspired by Hunter (2009).

[41] William Paley (1813) considers the possibility of an infinite chains of watches producing watches (Paley, 1813, Chapter 2, paragraph IV).

[42] The idea was inspired by Dennett (2017).

B. A planetarium is a complex machine or concrete representation of the heavens (and the complexity of the planetarium that it has in virtue of being a model of nature is derived from nature.)
C. Nature's complexity is greater than the complexity of a planetarium.
D. Posidonius' planetarium is a successful representation of the heavens.
E. Nature's order is caused either by chance, or by necessity, or by a divine mind.
F. Nature's order is not caused by necessity or chance because it is impossible that something less complex can be the product of rational design while the more complex thing (i.e., nature) it represents is not.
G. Therefore, nature's order is caused by the divine mind's rational design.

As Hunter notes, this 'neglected' version of the Posidonian argument (so without (1)) does not become obsolete through the rise of Darwinism or, as I have suggested, even robots. That's because it does not make any explicit claim about the appearance of design in nature. It's not an argument *from* design, but an argument *to* design.

Of course, there is a reason why this 'neglected' argument is neglected. A-D are dispensable. It's also not obviously sound because either (E) is incomplete, that is, there may be alternative ways to explain the origin of nature's complexity or order without a deist God; or the argument for necessity and/or chance can be made more robust and seem more explanatory than appeal to a divine mind. And (F) may be thought begging the question. In the next section I show that there was widespread familiarity with the (prima facie version) Posidonian argument in the early modern period in which the significance of premises (2-5)/(A-D) get re-conceptualized.

4 Early Modern Posidonian Arguments, especially Boyle

It is well known that Hume's *Dialogues Concerning Natural Religion* (1776) are modeled on, and often borrow heavily from, Cicero's *On the Nature of the Gods*.[43] In fact, most learned readers would

[43] There is a huge literature on this. But see Sessions (2002); Battersby (1979, pp. 239–52).

have been familiar with the Posidonian argument, because Cicero and *On the Nature of the Gods* continued to be read and quoted approvingly throughout the early modern period.[44] That Berkeley knew his Cicero is exemplified by the fact that he took the very idea of minute philosophers from Cicero as is mentioned on the cover-page and in the first dialogue of *Alciphron*.[45] Another quote from Cicero graces the cover-page of *Passive Obedience*.[46]

On the Nature of the Gods is, in fact, quoted in *An Essay towards preventing the Ruin of Great Britain*.[47] In *Passive Obedience* (Section XIV), Berkeley explicitly quotes one of Balbus' claims from Cicero's *De Nature Deorum,* that man is created to contemplate and imitate nature.

Perhaps more surprising is that Cicero is prominent among works that fit squarely in the modern canon of works at the intersection of philosophy and natural philosophy. More important, even when he is critical, Samuel Clarke calls Cicero 'that great Master' (*A Discourse*, 209) and 'the greatest and best philosopher, that Rome, or perhaps any other nation has ever produced' (*A Discourse*, pp. 292–293).[48] It's not just Cicero's moral philosophy that is read; in drawing on Newton, Clarke quotes approvingly from *On the Nature of the Gods* in his important Boyle lectures (1705), *A Demonstration of the Being and Attributes of God* (e.g. p. 110, where Toland is being mocked, and p. 229, where, as I discuss later, the Posidonian argument is explicitly discussed).

In fact, there were lively, high profile debates in the early modern period over Cicero's true philosophical views in *On the Nature of the Gods* (which anticipate the debates over Hume's views in the Dialogues.) For example, in his response to Collins's notorious (1713) *Discourse on Free Thinking* (which includes an epigraph

[44] For the origin of this in Renaissance thought, see Glacken (1967, pp. 54ff. & 376).

[45] Berkeley, *Alciphron, or The Minute Philosopher in Seven Dialogues* (*Works*, vol. 3).

[46] Berkeley, *Passive Obedience* (*Works*, vol. 1).

[47] See Stuart-Buttle (2019, p. 206). Berkeley, *An Essay towards preventing the Ruin of Great Britain* (*Works*, vol. 6).

[48] I am quoting Samuel Clarke's *A Discourse concerning the Unalterable Obligations of Natural Religion and the Truth and Certainty of the Christian Revelation* from the 1732 edition of *A discourse concerning the being and attributes of God: the obligations of natural religion, and the truth and certainty of the Christian revelation* (London: Knapton). I am using this edition (rather than earlier ones) because in it Clarke's reliance on the authority of Newtonian physics is most pronounced.

from Cicero's *On the Nature of the Gods*),[49] Richard Bentley, who had a much discussed correspondence with Newton and one of the leading classicists of the age, does not merely criticize Collins' arguments and positions, but has a lengthy analysis of how to interpret Cicero properly. (Collins had treated Cicero as a free-thinker).[50] The same strategy, including a motto quoting Cicero, is followed in *The Guardian*'s critical review of Collins's book (published on March 14, 1713) attributed to Berkeley by his son.[51]

But the most famous version of the prima facie Posidonian argument during the early modern period is probably to be found in Boyle. It occurs on a variant of a more familiar argument. First, I quote the familiar argument:

> 'tis like a rare Clock, such as may be that at Strasbourg, where all things are so skilfully contriv'd, that the Engine being once set a Moving, all things proceed according to the Artificers first design, and the Motions of the little Statues, that at such hours perform these or those things, do not require, like those of Puppets, the peculiar interposing of the Artificer, or any Intelligent Agent imployed by him, but perform their functions upon particular occasions, by vertue of the General and Primitive Contrivance of the whole Engine. (*A Free Enquiry*, in *The Works of Robert Boyle*, vol. 10, p. 448)

Boyle uses the world-clock analogy in order to drive home the idea that God's *general* providence works by general and original (this captures the sense of Boyle's 'primitive' in light of the 'first design') causes.[52] It presupposes Boyle's voluntarist treatment of God's agency.[53] Boyle's argument seems familiar to us, educated as we are

[49] For excellent background on Collins' and Toland's interest in Cicero, and the practice of quoting Cicero, see Tarantino (2016, pp. 81–100).

[50] See Bentley (1734), 'Phileleutherus Lipsiensis' *Remarks on a late Discourse of Freethinking*. I have inspected the seventh edition online (see 246ff): https://books.google.nl/books?id=4HtPAAAAYAAJ&hl=nl&pg=PA246#v=onepage&q=Cicero.

[51] It is, however, likely penned by Steele. And my argument does not rely upon it.

[52] To modern eyes it is tempting to read the 'general' causes as laws of nature. But in this passage Boyle could also be relying on the traditional idea that the clock has a real essence (the hidden from sight 'contrivance') from which effects follow in exception-less fashion (such a world would also be amenable to description by laws of nature, of course).

[53] See Henry (2009) but also Harrison (2002).

to see Darwinism, in part, as a response to Paley's watch.[54] For my present purposes I want to focus on the Strasbourg clock because Boyle uses it elsewhere that reveal his debt to Cicero (or some intermediary source).

For, on the *Usefulness of Natural Philosophy*, Boyle adds two claims to his treatment of the Strasbourg clock:[55] (i) 'the various motions of the wheels and other parts concur to exhibit the phenomena designed by the artificer in the engine…'; (ii) 'and might to a rude Indian seem to be more intelligent than Cunradus Dasypodius himself.' (Essay IV)[56] Here I ignore Boyle's low regard for the intellectual achievements of native Americans. The phenomena exhibited by the (second) Strasbourg clock were primarily astronomical, that is, it was a gigantic, massive planetarium in which heavenly motions and phenomena were faithfully represented.[57] In context, Boyle is explicitly rejecting local final causes (and action at a distance). That Cicero is probably his inspiration is confirmed not just by the great similarities in tropes, but also by the fact a few pages later he explicitly cites *On the Nature of the Gods* (for different purposes).

Boyle's version of the Posidonian argument (astronomical clock, ignorant foreigner) was familiar enough such that Locke would offer his own variant of a discussion of the Strasburg clock (without mention of Boyle) at *Essay* 3.6.3 and 3.6.9 but with 'a gazing countryman' and no Indian. The Essay also has a quote from Cicero's *De Natura Deorum* on its cover. Rather than piling on further examples, I'll treat it as established fact that the prima facie Posidonian argument was widely known in the early modern period.

Now I want to offer a more speculative ascription to the Early Moderns of recognition of a different version of the Posidonian argument. I have been unable to find an explicit statement of it. But it arises rather naturally upon reflection, and it illuminates the debate between Toland and Clarke.

Recall that the 'neglected' version of the Posidonian argument goes like this:

A. Artificial, complex machines are the product of rational design.

[54] See, for example, Boyle (1991, p. xvi).

[55] In his works Boyle uses the Strasbourg clock to offer many different kinds of arguments to design. Many of these are logically distinct from the Posidonian Argument.

[56] Conrad Dasypodius was the designer of the famous Strasburg clock.

[57] Check out this wonderful image: https://www.atlasobscura.com/places/strasbourg-astronomical-clock, accessed 1 February, 2020.

B. A planetarium is a complex machine or concrete representation of the heavens (and the complexity of the planetarium that it has in virtue of being a model of nature is derived from nature.)
C. Nature's complexity is greater than the complexity of a planetarium.
D. Posidonius' planetarium is a successful representation of the heavens.
E. Nature's order is caused either by chance, or by necessity, or by a divine mind.
F. Nature's order is not caused by necessity or chance because it is impossible that something less complex can be the product of rational design while the more complex thing (i.e., nature) it represents is not.
G. Therefore, nature's order is caused by the divine mind's rational design.

Recall that (F) seems to beg the question. And that the PSR seems to be presupposed in E. I made no effort to suggest that there is an important link between the PSR and F. But in the early modern period, they get linked together in a very famous passage:

> It follows from this both that (a) something cannot arise from nothing, and also (b) that what is more perfect – that is, contains in itself more reality – cannot arise from what is less perfect. And this is transparently true not only in the case of effects which possess (what the philosophers call) actual or formal reality, but also in the case of ideas, where one is considering only (what they call) objective reality. (Descartes, *Meditations on First Philosophy*, AT VII 40-41; CSM II 28-29; letters added to facilitate discussion).[58]

In the context in which this passage is taught and discussed in the scholarly literature, the main interest is in connecting the two causal principles (a&b) to Descartes's theory of ideas, the relationships actual, formal, and objective reality, and understanding how these connect to his argument for the existence of God. Later in the book Descartes treats (a&b) as clearly linked.[59]

[58] Quoted from Descartes (1988, p. 91).
[59] It seems one can derive (b) from (a). If something with more reality arose from something with less reality, then the quantity (more reality–less reality) would have arisen from nothing.) I thank David Gordon for discussion.

Descartes claims to derive or infer (a&b) from another principle, 'Now it is manifest by the natural light that (c) there must be at least as much (reality) in the efficient and total cause as in the effect of that cause.' This (c) is pretty much treated as axiomatic by Descartes. It has its roots in neo-Platonic conceptions of emanation which merged with Aristotelian ideas about efficient causation. The underlying idea is that an effect receives its qualities from a cause and these (cause and effect) are conceived hierarchically.[60]

I'll call (a-c), 'Descartes' causal principles'. The relationship between (a) and (c) is easy to discern (although one may wonder which one is truly the more fundamental principle). In addition, it's clear that with his embrace of (a)/(c) that Descartes is clearly committed to something akin to the PSR. That (b) follows from (c) is also pretty clear.

Obviously (b) is not identical to (F) in the neglected Posidonian argument. But if we are allowed to treat complexity as a species of perfection, as Descartes does in the First Replies,[61] then (b) underwrites (F). For (b) and ((C), from which (F) is derived) rely on the same intuition that the model or copy derives its key, effective properties, the ones that track or are morphic with reality, from reality. And reality is more perfect or nobler than a copy. What I assume, however, is that these causal principles are more widely shared in the early modern period until we see them explicitly challenged.

Of course, these reflections entail that (A-B) are misleading if we think of (to use Descartes' terminology) the total cause of a complex machine that tracks nature (say a portable planetarium) as limited to the human artificer that designed and built the concrete model. *Crucially, on the interpretation pursued here, the total cause of a planetarium includes something of, or presupposes, the natural order which it tracks.*

Now, how much of nature's order is presupposed in a concrete model of it, is worth careful consideration. But if we import these Cartesian causal principles into the Posidonian arguments we have been considering, we get a new premise:

(I) A condition of the possibility of (an intended) successful (concrete) scientific representation of nature is that nature is orderly.

[60] See Lin (2004, p. 32).
[61] See also Dennett (2008).

With this premise (I) we can drop (A-C) and doing so will be the basis of what I call a 'transcendental Posidonian argument'. Before I articulate the full version of it I motivate it by looking at critic of Cartesianism, Samuel Clarke. I argue that this – possibly even more anachronistic – transcendental interpretation of the Posidonian argument is a natural outgrowth of reflection on the scientific revolution in progress. The transcendental interpretation focuses on the fact that a scientific model of the world plays a crucial role in the Ciceronian argument.

An important aspect of the enduring attraction of the prima facie version of the Posidonian argument in the early modern period depends on the fact that *if* one is committed to the idea that science can reveal design of nature then progress in the sciences aided by, say, microscopic and telescopic technology keeps revealing new and ever more sophisticated evidence of design.[62]

To see how such an argument plays out, I discuss Samuel Clarke's Boyle lecture, *A Demonstration of the Being and Attributes of God* (1705). This is presented as a response to Hobbes and Spinoza and their followers, but the only follower mentioned is Toland, to whom I turn first.[63]

5 Toland's Appropriation of Newton.

Toland's *The Letters to Serena* (1704) is a rhetorically complex work in five letters.[64] The first three letters include a genealogy of the idea

[62] I suspect the first post-Copernican person to make *this* move was the unusual Leuven Jesuit, Leonard Lessius (Leys) in 1612. See Leonard Lessius, *De prouidentia numinis* (1612, p. 25). I have discussed the passage and its broader significance in my blog, https://digressionsnimpressions.typepad.com/digressionsimpressions/2019/01/on-the-discovery-of-progress-lessius-on-a-dutch-glasstelescope.html.

[63] I have discussed the complex relations among Clarke, Toland, and Newton in Schliesser (forthcoming) and Schliesser (2012).

[64] On Toland's philosophy, see Daniel (1984), and Dagron (2009). For, a useful introduction to Toland's views, especially as they relate to the reception of Newton and Newtonianism see Jacob (1969). Jacob treats Toland as a sincere critic of Spinoza and as a follower of Bruno. As my argument notes there are non-trivial differences between Toland and Spinoza (see Dagron, 2009, chapter vii), but I do not doubt that in the fifth letter to Serena, Toland is what I have been calling a Spinozist. This is not the place to explore the commonalities between Bruno and Spinoza or the ways in which Toland's criticism of Spinoza is a mere smokescreen. On these

of immortality of soul, a proto-feminist tract, and an account of justice amongst other themes discussed. The fourth letter is a self-styled 'confutation of Spinoza'[65] – like other English critics of Spinoza, Toland finds Spinoza's account of motion wanting – often using the authority of Newton's then recent *Principia* in the process; the fifth letter, by contrast, advances Spinozist themes by rejecting Newton's account of the vacuum, space, and God (amongst other doctrines).[66] Among the Spinozist positions that Toland adopts as his own is that God's immanence in nature (and the denial of the immateriality of the soul).[67]

Here I focus on a key feature of *Letter* four. In order to do justice to Toland's position, I introduce some anachronistic terminology: by '*anti-mathematicism*' I mean the expressed reservations about the authority and/or utility of the application of mathematics. Such anti-mathematicism can come in many guises and strands. Here I focus only on what I call '*The global anti-mathematicist strategy*' by which I mean to pick out those arguments and positions that challenge and de-privilege the epistemic authority and security of mathematical *applications as such*. To avoid misunderstanding, this strategy is compatible with allowing some subservient uses (for bits) of mathematics in one's physics (and praise for *pure* mathematics). The position pre-dates Toland. The canonical late seventeenth century expression of the global anti-mathematicist strategy can be found in Spinoza's so-called 'Letter on the Infinite' addressed to Lodewijk Meyer and published in his *Opera Posthuma*.[68]

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points, see Leask (2012). (Leask turns Toland into a Leibnizian of sorts, a topic that transcends this paper.) Recently, Toland has been read as interpreting Newton with a Lockean epistemology, see Wigelsworth (2003). For present purposes I can remain agnostic about Wigelsworth's main thesis, for he, too, recognizes Spinozism in Toland (see, especially, Wigelsworth, 2003, p. 530).

[65] *Letters*, 5.1, 163. I am quoting by letter, paragraph, and page-number to the original 1704 edition. There is a nice recent edition of John Toland's *Letters to Serena*, (Toland, 2013) which also provides original page-numbers.

[66] See Daniel (1984, op. cit., p. 11).

[67] It is useful to note that Toland coined the term 'pantheism' shortly after the *Letters* in 1705, in the title of his work, *Socinianism Truly Stated, by a pantheist*. See Jacob (1981).

[68] For a lot more details on Spinoza's position, see Schliesser (2018). Throughout the seventeenth century in response to the aspirations of what we may dub 'Galilean science,' there were informed criticisms of the

In order to understand what is at stake in Clarke's response to Toland it is indispensable that we have some features of Toland's *global anti-mathematicist strategy* in view. Toland expresses a key aspect of his position as follows: 'The Mathematicians generally take the moving force for granted, and treat of local motion as they find it, without giving themselves much trouble about its original [cause]; but the practice of the philosophers is otherwise, or rather *ought* to be' (*Letters* 4.8, p. 141, emphasis added).[69]

This passage presupposes a hierarchically organized intellectual division of labor between the 'mathematicians' who, Toland explains, find 'rules of motions' by 'observations learnt from…experience'; they only deal with 'local motion' (or a 'change in situation') in order to generate the 'ordinary rules of motion' by 'probable calculations' (*Letters* 4.8, p. 141). That is to say, these 'mathematicians' are primarily engaged in what we would call 'empirical induction' and 'instrumentalist description'.[70] Higher in status are the 'philosophers', who assign causes and the (causal) 'principles' of 'true' motion (*Letters* 4.8, p. 140).[71]

There are three key features of the hierarchical intellectual division of labor:

(i) it is normative ('ought to be');
(ii) mathematicians, or we might say, mathematical natural philosophers do not have last word on their own analysis (*qua* mathematician);
(iii) mathematicians are incapable of supplying what we really want – a causal understanding of how the world operates.

It is the combination of (i-iii) that makes Toland's position instantiate a global anti-mathematicist strategy. (That's compatible with him allowing a pragmatic or instrumental role for mathematics in physics.) In context, and throughout the *Letters*, Toland implies that the methodological stance of (the first edition of) the *Principia* explicitly recognizes a distinction between the discovery

utility and application of mathematics to natural philosophy. For an inventory of such arguments, see Tamás Demeter & Eric Schliesser, eds. (2019). See, especially, Nelson (2019).

[69] Daniel (1984 op. cit., p. 102), also notes the significance of this.

[70] Toland's position allows that 'mathematicians' may not realize that they are doing no more than this.

[71] The distinction is functional; it's of course possible that the very same person acts as a 'mathematician' and as a 'philosopher'.

of *local* forces (which, Toland grants, are discovered by Newton) and the 'general or moving force of all matter' (see *Letters* 5.29, p. 233–34). Toland may thereby be the first to interpret the methodological stance of Newton's *Principia* in an instrumentalist fashion – something that only becomes fashionable after the addition of the General Scholium and Clarke's exchange with Leibniz. For this precedes the changes to the *Principia* in response to the controversy over the status over action at a distance.[72] Here I leave aside the question to what degree Toland's interpretation of Newton can be defended in light of the details of the *Principia*.[73]Toland's strategy may well have inspired Berkeley's in *De Motu*.[74] But for present purposes another key move by Toland is to reject what we would call the invocation of a 'God of the gaps'.[75] He does so by appealing to the authority of Cicero. He then goes on to imply that one reason to favor the idea that motion is essential to matter is that it minimizes such invocation of gap-filling-God:

> [T]hey are forc'd at last to have recourse to God, and to maintain that as he communicated Motion to Matter at the beginning, so he still begets and continues it whenever, and as long as there's occasion for it, and that he actually concurs to every Motion in the Universe….As Cicero observes when the philosophers are ignorant of the cause of anything, they presently betake themselves for refuge and sanctuary to God, which is not to explain things, but to cover their own negligence or short-sightedness…
>
> I hold then motion is essential to matter…as inseparable from its nature as impenetrability or extension. (*Letters* 4.15-16, pp. 157-58)

In these passages, Toland is not merely criticizing occasionalist views, but all views, including even the concurrentist,[76] that require any activity by God. Toland contrasts two (coherent)

[72] Of course, there are modern interpreters that also claim that Newton was an instrumentalist. The most insightful defense of this view is McMullin (2001, pp. 279–310); for criticism see Smith (2001), Ducheyne & Weber (2008); cf. Schliesser (2011).

[73] There is often a conflation between Newton's stance toward action at a distance and his stance toward causal explanations as such. Recent Newton scholarship has done much to make some necessary distinctions, see Smeenk & Schliesser (2013).

[74] Berkeley, *De Motu* (*Works*, vol. 4).

[75] For discussion see Del Ratzsch (2014).

[76] See McDonough (2008, pp. 567–90).

positions: first, one claims that matter is passive and requires God to be the first and concurring cause. Second, one aims to minimize God's role altogether and, thereby, opts for active matter and 'activity' is an essential quality of matter. The second view dispenses with God's role as the first cause of motion and has a tendency to insist that the universe must have existed forever.

In a nutshell: Toland adopts the second position: 'I deny that matter is or ever was an inactive dead Lump in absolute Repose, a lazy and unwieldy thing…I hope to evince that this Notion alone accounts for the same Quantity of Motion in the Universe, that it alone proves there neither needs nor can be any Void, that Matter cannot be truly defin'd without it, that it solves all the Dificultys about the moving force, and all rest which we have mention'd before.' (*Letters* 5.16, pp. 159–60). By contrast, in a *Demonstration* Clarke adopts the former position (matter is passive, etc.), strongly implying that this is also Newton's position.[77]

So, the way to understand Toland's challenge is as follows: the mathematical structure of the *Principia* is ultimately neutral on matter being truly active or passive and what the general source of motion is. While Newton qua mathematician *talks* of forces as causes in order to help keep track of observed regularities, these do not pick out genuine explanatory causes in nature – that's the task of the philosopher and by Toland's lights Newton acknowledges this division of labour. Toland takes up the task to offer a philosophical conception of matter that coheres with the *Principia*; one in which matter is essentially active and, with a nod to Cicero's authority, that dispenses with a need for God (beyond a vague immanent substance monism in which God gives being to matter).[78] If, by contrast, you insist that matter is passive then you introduce the 'god of the gaps'.

Now, while the next section is devoted to analyzing Clarke's response to Toland, I do not have space to explain Clarke's response to Toland's matter theory here (or Berkeley's attitude toward Newton). But, while I do not want to downplay their differences, notice how much Toland anticipates features of Berkeley: they both think there is a hierarchical division of labor in which the

[77] There is a lively debate among Newton scholars on how to understand Newton's position on the activity and passivity of matter: see Kochiras (2009); Schliesser (2011); Ducheyne (2014); Chen (2020); Parker (2020).

[78] Despite Toland's criticism of Spinoza in *Letters* 4, the position is decidedly Spinozistic. See for very good work on Spinozistic active materialism, Wolfe (2010).

metaphysician/philosopher assigns causes while the work of the natural philosopher/geometrician can be interpreted as a mere tracking of the relations of the phenomena (for Berkeley, see *De Motu*, pp. 71–72; PHK, p. 107)). They are both in a non-trivial sense global anti-mathematicists (while allowing the use of mathematics for evidential reasons) and, perhaps, even instrumentalists about Newtonian natural philosophy. They do not take the self-understanding of the new sciences as authoritative in first philosophy.

Moreover, Toland's move is essential for understanding why people would have thought that the stance one takes about the nature of matter theory has significant effects on how one views the status of providence/Intelligence. In response to Toland, Clarke uses the Posidonian argument to link a particular conception of matter theory and scientific progress to the existence of Intelligence. By the end of the next section it should be clear that Berkeley's immaterialism undermines Clarke's framework.

6 Clarke responds to Toland

In the context of a polemic with Toland, who in the *Letters to Serena* with his own appeal to Cicero's authority rejects what we would call the invocation of a 'God of the gaps',[79] Clarke points out that when in Ancient times, 'Epicurus and his follower Lucretius' imagined 'finding fault in the frame and constitution of the Earth' this was somewhat plausible due to the 'infancy of natural philosophy' (although Clarke notes with satisfaction that even then the 'generality of men' were not persuaded). Clarke can point to recent discoveries in anatomy and physiology such as 'the circulation of the blood, the exact structure of the heart and brain' as well as the discovery of a number of veins and other vessels neither known nor imagined in ancient times. (*A Demonstration* pp. 227–28; cf. Hume's *Dialogues*, 11.11). Then Clarke writes:

> If Tully, from the partial and very imperfect knowledge in astronomy, which his times afforded, could be so confident of

[79] 'As Cicero observes when the philosophers are ignorant of the cause of anything, they presently betake themselves for refuge and sanctuary to God, which is not to explain things, but to cover their own negligence or short-sightedness.' (See John Toland, *Letters to Serena*, L4.15-16, pp. 157–58) While elsewhere in the *Letters,* Toland quotes Cicero's *On the Nature of the Gods*, here Toland gives no specific reference; he seems to echoing Cicero's *De Divinatione* 1.125-126.

> the heavenly bodies being disposed and moved by a wise and understanding mind, as to the declare that in his opinion, whoever asserted the contrary, was himself[80] void of all understanding: What would he have said, if he had known the modern discoveries in astronomy? The immense greatness of the world (I mean of that part of it, which falls under our observation), which is now known to be as much greater than what in his time they imagined it to be, as the world itself, according to their system, was greater than Archimedes' Sphere? (*A Demonstration of the Being and Attributes of God*, pp. 228–29)

The history of scientific progress becomes an added argument for the plausibility of the Posidonian argument.[81] In the *narrow* sense this is so because on Clarke's account, science discovers more evidence of apparent design where previously there just had been mystery or lack of knowledge and, thus, is capable of ever more refined representations of nature covering an increasing domain of nature. This fact feeds into a broader argument that Clarke makes in context: the history of scientific progress *itself* becomes a further argument for the existence of a designing and benevolent God. In fact, after listing a large number of Newton's then recent discoveries, Clarke interprets the history of scientific progress as an unfolding Biblical prophecy:

> We now see with how great reason the author of the Book of *Ecclesiasticus* after he had described the beauty of the Sun and Stars, and all then visible works of God in heaven and earth, concluded ch. 43, v 32 (as we after all the discoveries of later ages, may no doubt still truly say,) 'There yet hid greater things than these, we have seen but a few of his Works.' (*A Demonstration* XI, pp. 232–33)[82]

[80] Clarke quotes here book 2 of *The Nature of the Gods* in Latin. The passage is a few paragraphs removed from the Posidonian argument. The reference to 'Archimedes' sphere' reminds us that we are still in the ambit of the Posidonian argument.

[81] Gibbon seems to have had this point in mind in his 'Address' collected in Gibbon (1797, vol. 3, p. 469), and the footnote that calls explicit attention to Cicero. See https://books.google.nl/books?id=17E8AAAAYAAJ&pg=PA469&dq=Newton+Posidonius.

[82] This is a rare occasion where Clarke appeals (against his official purposes) to a Biblical text at all in a *Demonstration*. Given the non-canonical (or deuteron-canonical) status of *Ecclesiasticus*, Clarke's choice is worth exploring, but I cannot pursue the question here. (But since Clarke is not deriving

Newton's then recent discoveries become an important evidentiary signpost for understanding scientific progress as an open-ended, unfolding and confirmation of confident Biblical prophecy.

Now we can return to the Posidonian argument in order to explore the transcendental interpretation of it. As I have emphasized the Posidonian planetarium is more than a time-keeper; it is capable of predicting other heavenly phenomena, especially eclipses. So, rather than viewing the heavenly phenomena as portents of danger (revolution, omens, etc.) the scientific representation fits them into an ordered universe.[83] That is, the empirical success of the planetarium points to the significance of predictable order; the designer of a planetarium presupposes an orderly celestial globe.[84] For example, In Newton's *Principia* this orderliness is crowned by the original closing pages of the book, Newton's ability to predict the orbits of comets.[85]

So, we can put the significance and true intuitive force lurking within all elements of the Posidonian argument in anachronistic fashion: a condition of the possibility of (an intended) successful scientific representation of nature is that nature is orderly or ordered. Then *a history* of successful scientific representations, and technologies of representation relying on these, becomes a distinct and over time increasingly compelling argument for an orderly nature.[86] This leads me to the promised transcendental interpretation of the Posidonian argument.[87] The form of the transcendental intrpretation is as follows:

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doctrine, it should not raise too many eyebrows.) I thank Peter Anstey and David Gordon for discussion.

[83] This is noted in Adam Smith, 'The History of Astronomy' (3.1, EPS, p. 48). All my references to Adam Smith's History of Astronomy are to paragraph and page-numbers in *Essays on Philosophical Subjects* in the Glasgow edition.

[84] This point stands even if one insists that the design of the planetarium is based on empirical data.

[85] The classic paper is Kriloff (1978, p. 640). For the contextual meaning, see Albury (1978).

[86] This is so, even if the representations do not track the causal order of nature, but merely track or predict the phenomena. Hunter (2009) puts the point very precisely: 'It is the complexity internal to both the model and its original. Let us call it the pattern (P) which both the original and its model instantiate. By virtue of P the original and the copy are partially isomorphic' (p. 244).

[87] Clerk Shaw was the first to remind me of the significance of Kant's *Critique of Judgment*, where the logical purposiveness of nature is

I. A condition of the possibility of (an intended) successful scientific representation of nature is that nature is ordered.
II. Science has a history of success.
III. The world's order is not produced by nothing.
III *. The same cause or principle is responsible for the existence of the world and its order.
IV. Order is produced by necessity, or by chance, or by designing mind.
V. The particular order science finds is not the subject of chance or necessity.
VI. ∴ So nature's order must be produced by a designing mind (or nature is designed).

I make three claims about this version of the argument. First, most early moderns who were interested in such arguments were interested in re-affirming that God was the cause of the world. For Christians it is natural to assume (III*) there is a tight link because the cause of the existence of nature and the cause of its order are taken to be the very same.[88]

Second, the transcendental version of the Posidonian argument changes the significance of the history of science and the character of science more generally. For, on the prima facie approach to the Posidonian argument when it comes to the question of intelligent design in nature, science is, in principle, perceived to be a neutral means in order to establish the nature and existence, if any, of the God(s). However, on the transcendental version of the Posidonian argument, science is not neutral at all about the existence of an Intelligence, because science itself presupposes for its very possibility and intelligibility that there is order and a source of order. So, while the scientist has a kind of privileged access to the hidden features of nature, she has it in virtue of a commitment to finding the hidden order of God's design in our discoveries.

Third, on the transcendental version, the force of the Posidonian argument does not rely anymore on the (perhaps dubious to post-Humeans or post-Darwinians) explicit assumptions of the original

presupposed as a 'regulative principle', but not constitutive principle, in one's science (see the antinomy of the Judgment).

[88] In the 'Preface' to (Nieuwentyt, 1719, ix), Nieuwentyt asserts that in Cicero the 'existence' of the gods are taken for granted, but that the debate turns on the nature of the gods. A few pages later, Nieuwentyt introduces a version of the argument that is now attributed to Paley (see Jantzen 2014, pp. 168–69 with great material).

argument in Cicero (such as 'nature's attainments transcend those achieved by human design') and the role of Descartes' causal principles in the neglected version of the argument. Moreover, now the Posidonian argument stresses the structural resemblance between state-of-the-art-planetary mechanism and the celestial globe, but does not appeal to aesthetics more generally nor claims about analogies between the designer of the planetarium and heavens.[89] As in the neglected version of the Posidonian argument, this argument does not appeal to apparent design to motivate the argument nor mentions it in its premises.

Of course, the premises of the transcendental version of the argument are not without controversy. Premise (I) may be thought too strong in two ways. First, it may be the case that all that is required is to presuppose in a scientific practice that a relevant region of nature is ordered. So one can imagine rewriting premise (I) as follows:

> I*. A condition of the possibility of (an intended) successful scientific representation of a region of nature is that a region nature is ordered.

While this would require reformulating other premises (e.g., III), it does not undermine the conclusion of the argument. In fact, as it turns out that ever more bits of nature are orderly (comets, geology, etc.), it may well strengthen the overall argument. Even so, to what extent all regions of nature share the same order or whether the same region remains orders is also not obvious (something Newton and Hume worried about).

Premise (II) is hard to evaluate – a lot depends on one's baseline and one's expectations. But it is no surprise that as the scientific revolution unfolds this premise seems very secure, despite the development of pessimistic meta-induction arguments (offered, say, by Aristotle's Ghost in Swift in *Gulliver's Travels*).[90]

Premise (III) relies, in its most general sense on a version of the causal principle or on the PSR. Not all thinkers embraced the PSR

[89] Hunter puts the insight very nicely: 'The new argument does not make the mistake of comparing unconnected instances of complexity. Its very different strategy is to exploit the fact that one and the same instance of complexity is found simultaneously in two places.' (p. 242) To be clear: Hunter's 'new' argument is not my 'anachronistic' argument, but akin to what I have called the 'neglected' version; Hunter's 'new' argument preserves the neutrality requirement.

[90] See Schliesser (2005, pp. 705–706).

in the early modern period, but I am unfamiliar with anybody that denies the causal principle. As I noted above (III*) is in one sense controversial – there were lots of debates over the relationship between God and secondary causes –, but in other sense not so controversial (because God's omnipotence was simply assumed). In addition, there are hidden simplicity and parsimony assumptions packed into (III*).

Premise (IV) is inherited from the ancients. After Berkeley, philosophers start to explore new sources of order (e.g., the mind's imposition, emergence, and even the development of a science that deals with the nature of order, entropy, etc.) and start to challenge the naturalness of this premise.

Premise (V) requires argument. There are some philosophical proponents of chance (most notably Hume) as a source of order. And once probability theory is developed, the argument for chance is made in sophisticated fashion (by D'Álembert and Laplace) in the context of Enlightenment debates over cosmology and cosmogony in the generation after Berkeley. But in Berkeley's life most of the philosophical debates center on the challenges of Spinozism to this premise. In a nutshell critics of Spinozism (Clarke, Newton, MacLaurin) argue that while it predicts (by stipulation) necessary variety, it fails to predict the *particular* variety we observe. But as cosmogony starts developing (from Kant onward), the Spinozist position gets recast and becomes more plausible again. But in so doing another premise (III*) starts to become less likely.

That is, even if one is distinctly reserved about final causes or God's providence, the transcendental version of the argument tightly links scientific progress to God's or nature's order. If you accept this argument then, with scientific progress, you get a providential deism for free. It also motivates commitment to the possibility of scientific progress.

Before I return, in closing, to Berkeley, let me note one more feature about Clarke's version of the transcendental version of the Posidonian argument. Above I quoted Clarke on Tully and Archimedes' sphere, and the fact that the history of scientific progress makes the Posidonian argument even more compelling now than it was in Cicero's time. On the preceding page, Clarke had expressed a version of the thought as follows:

> If Galen so many ages ago could find in the construction and constitution of the parts of a Humane body, such undeniable marks of Contrivance and Design; as forced him Then to

> acknowledge and Admire the Wisdom of its Author: What would he have said, if he had known the Late Discoveries in Anatomy and Physick, the Circulation of the Blood, the exact structure of the Heart and Brain, the Uses of Numberless Glands and Valves for the Secretion and Motion of the Juices in the Body, besides several Veins and other Vessels and Receptacles not at all known, or imagined for so much as to have any Existence in his Days, but which Now are discovered to serve the Wisest and most exquisite Ends imaginable? (Demonstration, p. 226)

Here Clarke relies on modern discoveries about the hidden structure of living things, plants and animals. That is to say, the larger context of Clarke's Posidonian argument treats the natural and living world symmetrically. Our inquiry of nature generated, compared to the by no means mean achievements of the Ancient world, hitherto unimaginable signs of order and functionality.

7 Berkeley's Hypothetical Critic

Let's, finally, return to the eleventh objection. My claim is now straightforward. In Berkeley's presentation of the eleventh objection, we can discern that this objection involves anxiety that Berkeley's philosophy is undermining appeal to Clarke's version of the Posidonian argument. I quote:

> [I]t will be demanded to what purpose serves that curious organization of plants, and the animal mechanism in the parts of animals; might not vegetables grow, and shoot forth leaves of blossoms, and animals perform all their motions as well without as with all that variety of internal parts so elegantly contrived and put together; which, being ideas, have nothing powerful or operative in them, nor have any necessary connexion with the effects ascribed to them? If it be a Spirit that immediately produces every effect by a fiat or act of his will, we must think all that is fine and artificial in the works, whether of man or nature, to be made in vain. By this doctrine, though an artist hath made the spring and wheels, and every movement of a watch, and adjusted them in such a manner as he knew would produce the motions he designed, yet he must think all this done to no purpose, and that it is an Intelligence which directs the index, and points to the hour of the day. If so, why may not the Intelligence do it, without his being at the pains of

> making the movements and putting them together? Why does not an empty case serve as well as another? And how comes it to pass that whenever there is any fault in the going of a watch, there is some corresponding disorder to be found in the movements, which being mended by a skillful hand all is right again? The like may be said of all the clockwork of nature, great part whereof is so wonderfully fine and subtle as scarce to be discerned by the best microscope. In short, it will be asked, how, upon our principles, any tolerable account can be given, or any final cause assigned of an innumerable multitude of bodies and machines, framed with the most exquisite art, which in the common philosophy have very apposite uses assigned them, and serve to explain abundance of phenomena? (PHK, 60)

In the first sentence of the quote we see a clear allusion to Clarke's use of Galen in the Demonstration. In the third sentence, there is a clear allusion to Clarke's extension of Boyle's prima facie version of the Posidonian argument. And further down the paragraph, the hypothetical critic echoes Clarke by reminding the reader of Berkeley that there is still a great deal to be discovered of nature ('the clockwork of nature, great part whereof is so wonderfully fine and subtle as scarce to be discerned by the best microscope'). So, while it is true that the characteristic features of the Posidonian argument are not mentioned, PHK conveys central features of Clarke's particular presentation of it.

The connection to the Posidonian argument is reinforced and even strengthened by Berkeley's restatement of the objection in paragraph 64:

> that what has been objected in sect. 60 amounts in reality to no more than this: ideas are not anyhow and at random produced, there being a certain order and connexion between them, like to that of cause and effect; there are also several combinations of them made in a very regular and artificial manner, which seem like so many instruments in the hand of nature that, being hid as it were behind the scenes, have a secret operation in producing those appearances which are seen on the theatre of the world, being themselves discernible only to the curious eye of the philosopher. But, since one idea cannot be the cause of another, to what purpose is that connexion? And, since those instruments, being barely inefficacious perceptions in the mind, are not subservient to the production of natural effects, it is demanded why they are made; or, in other words, what

> reason can be assigned why God should make us, upon a close inspection into His works, behold so great variety of ideas so artfully laid together, and so much according to rule; it not being credible that He would be at the expense (if one may so speak) of all that art and regularity to no purpose. (PHK, 64)

The restatement makes clear that the critic's worry is really about Berkeley's immaterialism reopening the door to chance ('ideas are not anyhow and at random produced'). And also, by undermining the argument for final causes, even the system of necessity ('all that art and regularity to no purpose'). The whole point of securing Intelligence in the Posidonian argument, is to rule out necessity and chance. In addition note, too, that the critic is concerned that Berkeley's position makes pointless the scientist's effort to find hidden structure. The cultural significance of the Posidonian argument is precisely that scientific activity is an act of faith *and* strengthens it rationally. Finally, the restatement of the hypothetical critic also reveals the commitment to something like the PSR in making scientific enquiry intelligible ('what reason can be assigned why God should make us, upon a close inspection into His works, behold so great variety of ideas so artfully laid together, and so much according to rule').

Now Margaret Dauer Wilson had claimed that 'in these sections Berkeley is confronting an opponent who simply argues that on his principles the organization of nature as we know it makes no sense. Berkeley contends that this organization does have a point, though not a causal role' (Dauer Wilson, 1999, p. 247). This is right in so far that Berkeley does deny that that this organization involves efficient causes. Instead he proposes his doctrine of signs to explain nature's regularity. But Berkeley does insist that his argument leaves room to conclude the 'wise contrivance' of nature's order. For he has no doubt that the 'order and connexion between' our ideas (PHK, 64) is a sign of the order imposed by Intelligence. That is to say, the eleventh objection turns on the relationship between the hidden order of nature and the order and functionality science finds in providing evidence for the working of providence.

Conclusion

I have used the exchange between Garber and Dauer Wilson to illustrate the benefits of my interpretation of this larger context. For, the larger historiographical point I wish to illustrates that even after a

long generation of work in the so-called contextual revolution,[91] the philosophical context of even quite canonical texts is sometimes not yet sufficiently grasped.

I have argued that the eleventh objection expresses anxiety over the status of the Posidonian argument in light of Berkeley's immaterialism. I do not mean to suggest that Berkeley's response to the hypothetical critic who is anxious to defend the existence and operation of Intelligence leaves everything untouched. Berkeley's response reiterates that nature is law-governed.[92] And, in fact, Berkeley articulates a rather modern (in Cassirer's sense) conception of what can be discovered by science:[93] 'There are certain general laws that run through the whole chain of natural effects; these are learned by the observation and study of nature, and are by men applied as well to the framing artificial things for the use and ornament of life as to the explaining various phenomena: which explication consists only in showing the conformity any particular phenomenon has to the general laws of nature, or, which is the same thing, in discovering the uniformity there is in the production of natural effects' (PHK, 62).

But Berkeley also re-orients the end of scientific discovery of nature's hidden complexity and order. This need not lead to the denial of (contemplation of) Intelligence (even if the point is 'the use and ornament of life' or providing 'signs for our information' (PHK, 66)).

Of course, that nature is orderly, even law-governed, is a key feature of the Posidonian argument is. If anything, in the Transcendental version of the argument it is of central importance. So, Berkeley's argument does not undermine the legitimacy of using the history of scientific success as support for Intelligence. In fact, to somebody with an eye toward the Posidonian Argument, PHK 60-66 reveals the centrality of order/law-governedness to the whole argument. Berkeley's response to the eleventh objection gave Hume the clear target he needed.

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[91] See Mercer (2019).
[92] See Ott (2019).
[93] Cf. Ducheyne (2006).

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