FINE-TUNED OF NECESSITY?

Ben Page

Abstract: This paper seeks to explicate and analyze an alternative response to fine-tuning arguments from those that are typically given—namely, design or brute contingency. The response I explore is based on necessity, the necessitarian response. After showing how necessity blocks the argument, I explicate the reply I claim necessitarians can give and suggest how its three requirements can be met: firstly, that laws are metaphysically necessary; secondly, that constants are metaphysically necessary; and thirdly, that the fundamental properties that determine the laws and constants are necessary. After discussing each in turn, I end the paper by assessing how the response fares when running the fine-tuning argument in two ways, as an inference to best explanation and as a Bayesian argument.

Fine-tuning arguments for theism generally run as follows.[1] First, we are told that in order for life to exist, very precise laws of nature, constants of nature, and initial conditions are required,[2] without which life would be impossible.[3] Advocates then contend that design is the best explanation or most likely hypothesis for these requirements being met, as opposed to alternatives. Collins, the most prominent contemporary advocate, canvasses one alternative, brute contingency, where this answer takes two forms: either a "naturalistic single-universe hypothesis . . . the existence of which is an unexplained, brute given" or the "naturalistic multiverse hypothesis" (2009, 204).[4] I would like to avoid brute contingency responses to the argument and have nothing further to say about them here; rather the

---

[1] Note from the outset that, following standard practice, I do not mean to imply any kind of deliberative action on behalf of an agent by the language of 'fine-tuning.'

[2] For a detailed explication of what I mean by 'precise' see: Hawthorne and Isaacs 2018, 138–141, 162–164.

[3] Collins (2009, 211–222) gives examples of laws, constants and initial conditions as evidence of fine-tuning, whilst Swinburne (2004, 172) only uses laws and initial conditions, and Hawthorne and Isaacs (2018, 138–164) only constants.

[4] Swinburne (2004, 153–191) does likewise, whilst Leslie (1989) gives necessitarianism an extremely brief mention.

aim is to explicate and assess an alternative reply based on necessity, the necessitarian response.[5]

For the purpose of introduction, the necessitarian response, put simply, says the laws and constants of nature are metaphysically necessary, such that they do not vary across possible worlds.[6] Yet since the fine-tuning argument requires contingency, given necessitarianism, the argument fails. Van Inwagen has recently suggested that this reply is "much more interesting than the [brute contingency option]" (2015, 206), yet ultimately he finds it wholly unpersuasive (2015, 207). Oppy also gives it briefly as an option for blocking the argument if one "supposes that every possible world 'shares an initial part' with the actual world" (2013a, 27; 2016, 33). Given that Oppy appears to hold this, that every possible world shares an initial part (2013b, 47), we can take him to think necessitarianism persuasively causes problems for the fine-tuning argument.[7] Despite this and given the increasing interest of necessitarianism within the metaphysics of science, the response has never been sufficiently explored, and this is something I seek to rectify here.

Before outlining the structure of the paper, I must first note that I will only deal with two aspects of fine-tuning—laws and constants—therefore neglecting initial conditions. I do this for three reasons: firstly, because Bird (2014, 285–289) has recently given a necessitarian account of these conditions; secondly, in order to account for this data, my proposal would require extra elements that need defending, which I am unable to do here;[8] and finally, since some have questioned whether initial conditions should be thought of as distinct from laws (Sklar 1984, 1990; Frisch 2004). The response therefore only explicitly attempts to deal with the data of fine-tuning related to the laws and constants of nature.

In order to lay out fully and assess the necessitarian response, the structure of the paper will be as follows. I start by showing why fine-tuning requires contingency, and why necessity might be thought to block the argument. Subsequently, I formulate the response necessitarians can give, suggesting that three requirements need to be met: firstly, that laws are metaphysically necessary; secondly, that constants are metaphysically necessary; and thirdly, that the fundamental properties that determine the laws and constants are necessary. I discuss each of these elements in turn, suggesting how one might argue for them, before ending the paper by assessing how the response fares when running the fine-tuning argument

---

[5] The necessitarian response could also come in a multiverse variety, and this may cause distinct problems for the argument not addressed here since I focus on a single-universe account.

[6] They are therefore necessary in a *de re* rather than *de dicto* sense.

[7] Oppy (2013a; 2013b) thinks a similar move can be made against certain cosmological arguments. See Leftow 2017 for a reply; some of the comments made by Leftow would also be applicable to the necessitarian picture examined in this paper.

[8] Namely, the necessity of the initial quantity and place of properties.

in two ways, as an inference to the best explanation and as a Bayesian argument.

1 The Requirement of Contingency for Fine-Tuning

A major assumption behind fine-tuning arguments is that finely tuned aspects of nature could have been otherwise—that is, the laws and constants of nature, at least those related to fine-tuning, are contingent.[9] This assumption is one that typical respondents who advocate design and brute contingency usually take for granted. Those who advocate the design hypothesis presumably think the instantiated design of nature could have been otherwise. Similarly, those adopting a brute contingency position, be that of a single universe or multiverse, allow for the possibility that a different brute contingent could have been instantiated. The necessitarian, by contrast, denies this initial assumption, claiming it isn't possible that the laws and constants have been otherwise; they are necessary.[10]

Before spelling out why this blocks the other responses, it is important to understand the types of necessity used throughout this paper. First is narrow logical necessity, where the "truths of propositional logic and first order quantification theory" (Plantinga 1974, 1) are what is necessary in this sense. Next is broad logical necessity or metaphysical necessity, which Fine (2005, 236) characterizes as "the sense of necessity that obtains in virtue of the identity of things."[11] Kripke provides some examples of this type of necessity when he claims Hesperus is necessarily identical with phosphorous (1980, 108–110), and gold necessarily has the atomic number 79 (1980, 123–125). It is thus because of what Hesperus is that it is necessarily identical to phosphorus, with the same being said for gold and its atomic number, 79. Metaphysical necessity, then, concerns "being and its modes, whereas logic [and thereby logical necessity], properly understood, does not concern being in general but rather, the formal properties of and relations between propositions" (Lowe 1999, 10).[12] Finally, there is

---

[9] Perhaps a different type of argument to theism could be run without assuming this, that is where the laws and constants are necessary. I suggest one below but note that it is far weaker than the standard fine-tuning argument.

[10] That they are necessary may not mean that there is no sense in which we can say the laws and constants are fine-tuned. For instance, suppose we found out, perhaps due to computer modelling, that the range of laws and constants that are life-permitting is very small, and then also found out that the laws and constants that hold in this world hold in every possible world. There is still a sense in which the life-permitting range of laws and constants is small, and therefore fine-tuned, even though it is impossible that any other laws or constants hold. However, this paper in no way relies upon this point, and if one thinks the language of fine-tuning no longer should be used when the laws and constants are necessary, then one can re-word what I say at various points without loss of content.

[11] For more on the distinction between logical and metaphysical necessity, see Kripke 1980; Plantinga 1974, 1–9; Lowe 1999, 8–22; Leftow 2012, 33–38; Fine 2005.

[12] However, despite what is said here, and the examples of metaphysical necessity given, as Gendler and Hawthorne (2002, 4) write, the notion "is standardly taken to be primitive."

nomic or physical necessity, which holds in virtue of the laws of nature. However, unlike the prior necessities, this necessity is relativized from world to world, since it is assumed that different possible worlds could have different laws. For the rest of the paper, the necessity that will most concern us is broadly logical/metaphysical necessity, and this is what I will refer to unless otherwise stated.[13]

How then does necessity block the argument? The fine-tuning argument asks for either an explanation or most likely hypothesis behind the fine-tuning data, where all the data are assumed contingent—that is, could have been otherwise. But if the fine-tuning is necessary, then it cannot vary across metaphysically possible worlds. The laws and constants would never vary and hence aren't contingent.[14] The necessitarian therefore denies the contingency claim inherent in the argument and replies that the laws and constants are metaphysically necessary; nothing further is needed.[15]

I think many theists should think this response less terrible than many previously have, even if they ultimately think it unsuccessful. The reason for this change of heart is that the response mirrors many theistic answers concerning explanations of God's existence. Paralleling the necessitarian, who holds that the laws and constants are broadly logically/metaphysically necessary, "most analytic philosophers hold that if God exists, He exists with broad logical necessity" (Leftow 2010, 141). More importantly, theists who suppose God exists with this type of necessity also typically claim that appealing to metaphysical necessity is sufficient for ending explanatory chains, evidenced in responses to questions such as "what explains God's existence?" For instance, Plantinga writes,

> perhaps a necessary being may be characterized as (a) a being such that some statement referring to it can properly serve as a final answer in this sort of question and answer series, an answer which puts an end to the series. . . . such a being must be one about which the question "Why does it exist?" *does not arise* or cannot sensibly be asked. A necessary being, therefore, may be further characterized as (b) a being about which one cannot sensibly ask why

---

[13] Craig (2008, 161–164) thinks the necessity necessitarians will appeal to is physical necessity. Perhaps a necessitarian could respond in this way; however, I think targeting metaphysical necessity is the best option. The reason for this is that since I take physical necessity to hold in virtue of the laws of nature, I cannot claim the laws of nature themselves are necessary in this sense. Perhaps one could claim that the constants and initial conditions are determined by the laws of nature and therefore hold with this type of necessity, but I do not opt for this view here. The second reason I opt for metaphysical necessity is that it falls out of certain positions taken in modal metaphysics.

[14] An objection might immediately present itself—namely, that I can conceive that the laws and constants are different and therefore it is possible that they are different. This is perhaps the most important objection to the view, and it will be discussed once the response is set out more fully.

[15] van Inwagen (2015, 208) seems to agree that this is sufficient for blocking the argument.

> it exists. When the theist, therefore, asserts that God is
> the necessary being, we may construe his remark in the
> following way. He is pointing out that we cannot sensibly
> ask, "Why is it that God exists?"(1967, 181–182)

The necessitarian follows Plantinga in all he says, but substitutes laws and constants for God. If the laws and constants are necessary, then it is difficult to see any explanatory differences between the two. Hence necessity, if plausible, undercuts the argument, or at least theists who endorse the move made above by Plantinga should think so.

2 The Proposal

But you are likely thinking, this is all well and good, necessity might block the argument, but the real question is whether it is plausible.[16] It therefore seems time to start providing some reasons for thinking that it is. Briefly the necessitarian proposal I explicate says, the laws of nature are metaphysically necessary, as too are the constants, and that the instantiation of the properties that determine these laws and constants is also necessary. This final component is especially important since one could think both the laws and constants are metaphysically necessary, and yet also that they could have been different.[17] Before looking at the elements of the proposal in detail, I should note that the view of laws and constants I set out will require that the world is composed of dispositional properties,[18] a view that has received much attention in recent years (Bird 2007; Marmodoro 2010; Groff and Greco 2013; Jacobs 2017).

Dispositions, powers, potencies, and capacities are entities that have their causal role essentially such that they cannot vary across possible worlds. For instance, take the dispositional property being negatively charged. As a dispositional property the identity of this property is defined in terms of its causal role, for instance repelling other negatively charged entities. Given

---

[16] A reviewer suggests that merely establishing the possibility of necessitarianism is enough to cause problems for fine-tuning arguments, since the burden of proof will be on the proponent of fine-tuning arguments to refute necessitarianism. This may be correct, although the possibility to be established will need to be the metaphysical rather than epistemic possibility. However, in the literature it is the lack of plausibility of the view that seems to be the concern regarding necessitarianism, rather than its impossibility. As such, here I try to suggest why one might think it is plausible, but if one wishes to follow the reviewers thought, then one may read the remainder of the paper as my trying to merely show that necessitarianism is possible.

[17] How one could think this I hope will become clearer as the paper proceeds, but put briefly, if a property's *identity* determines what laws and constants are, then it is metaphysically necessary that given the *existence* of these properties there are these laws and constants. As such, the laws and constants are metaphysically necessary given the properties that exist, but it is a further question whether the *existence* of the properties themselves are metaphysically necessary. This is why necessary instantiation is also required for the necessitarian response I give.

[18] Perhaps necessitarianism does not require this, but my version will.

this, one could not have the dispositional property negative charge and have it attract other negatively charged entities. A property that did this would just be a different one, not the disposition negative charge. This contrasts the other popular conception of properties, categoricalism, which rejects the link between a property's causal role and its identity, instead thinking a property's nature is "self-contained, [and] distinct from the powers that they bestow" (Armstrong 1997, 69). Thus, unlike dispositions, categorical properties have a causal role that varies across possible worlds, and as such requires quidditism, where each property has a primitive identity that enables it to have different causal roles across possible worlds whilst retaining its identity. Given this, reusing our property of negative charge, a categoricalist would claim that this property has a quiddity that provides it with a primitive identity such that negative charge could take on radically different causal roles in other possible worlds, for instance attracting other negatively charged entities, smelling of roses, or tasting of chocolate. The necessitarian view I explicate will rely upon the assumption that all worldly causal efficacy is in some way due to dispositions; hence, dispositions will play a key role in the account of laws and constants.[19] I don't try to defend a realist view of dispositions and their universal scope here, since this is a task that has been undertaken elsewhere; given this, my reliance on dispositions should not be seen as an ad hoc postulate.

2.1 Necessary Laws of Nature

Turning to the necessitarian view, the dispositionalist account holds that laws are metaphysically necessary.[20] However, other accounts of the metaphysics of laws endow laws with differing modal status. The easiest way of showing why dispositionalists think laws are necessary is by contrasting them with full contingency accounts (Humean) and partial contingency accounts (strong external governing laws).

   The Humean empiricist position, following the traditional reading of Hume, holds that there are no connections in nature and that laws merely describe the regularities observable in the world. Nothing determines that something does *X* or *Y*, rather *X* or *Y* happens and laws simply describe those regularities. As such, no necessity is involved in laws. Everything is contingent and everything could have been otherwise. Thus, fine-tuning arguments presumably work on Humeanism since it appears that different regularities could have occurred, some leading to life-prohibiting worlds and others to life-permitting worlds. Despite this, Humeans might shrug their shoulders at fine-tuning data, saying there is no explanation of the data. They can say this because, given empiricism, we need not think there

---

[19] Thus, one could hold a dualist, dual-aspect, or monistic view concerning dispositional properties.

[20] The vast majority of those who think dispositions are fundamental properties think this. I will state what this claim entails shortly.

is an explanation as to why the laws are as they are since thinking this is an import of rationalism and is therefore something many empiricists won't accept. Hence, the fine-tuning argument only works on Humeanism if one also has a little bit of rationalistic blood.[21] Realists about dispositions have had much to say about Humeanism recently and ultimately reject it since they think laws are more than mere descriptions of regularities,[22] instead thinking that laws act with some type of necessity (Mumford 2004; Ellis 2001).

The second view of laws is associated with Dretske (1977), Tooley (1977), and Armstrong (1983) and the anti-reductionist positions of Carroll (1994) and Lange (2000)[23]—what I call the strong-external-governing conception. Briefly put, laws are necessary connections within this world, either between universals or tropes, but this necessity does not carry across possible worlds. One reason for adopting this type of necessity is due to a thought experiment in which its simplest form asks us to imagine a world with all the same properties but different laws. For instance, take 'water/H_2O,' either as a universal or trope, and assume in this world that it is nomically linked with the universal or trope 'boils at 100°C.' The idea behind the thought experiment is that it is merely a contingent fact that 'water' is linked with 'boils at 100°C,' since we can imagine that 'water' could have been linked with 'boils at 112°C' or 'boils at 58°C.' Different possible worlds will have different boiling points of water, not because the normal conditions are different, but because the nomic link is different. If we can imagine something like this, the thought continues, then laws and properties are distinct. As a result, the laws could have been different and the properties the same, the properties different and the laws the same, or both could have been different.[24]

The thought experiment is supposed to motivate one into rejecting Humean contingency but doesn't force full-blown necessity. Rather, it suggests a distinct type of necessity, what Armstrong (2010, 41) calls "an intermediate necessity, indeterminate between Humean contingency and necessity . . . 'nomic necessity.' " Although it is notoriously difficult to work out exactly what this kind of necessity is (Lewis 1983, 366), this account of laws also allows the fine-tuning argument to run without issue since the laws could have been different. For instance, different possible worlds will have different boiling points for water, not because the conditions are different, but because the nomic link is different. The defender of the

---

[21] This is only an escape for Humeans, since the other positions are rationalistic enough.

[22] Simpson (2017) argues against those who try to combine Humeanism and a realist view of dispositions.

[23] Carroll and Lange think laws are metaphysically contingent in the way I describe, but they don't explicate the necessary connection since they are anti-reductionists.

[24] For further elaboration on this thought experiment, see Tooley 1977 and Carroll 1994, 77–85.

fine-tuning argument to theism can then extrapolate this to instances of fine-tuning they are interested in and the argument is off and running.

Dispositionalists also reject this view since they find categorical properties, which this position seems to require, objectionable and therefore think the thought experiment given above, which motivates this position, does not describe a genuine possibility.[25] Instead they hold that each causal property has a dispositional essence, something the property is necessarily directed towards, where this gives a property its identity.[26] Thus, if one tried to rip the directionality out of a disposition, the rupture would be so great that the property itself would no longer exist. Its identity would have fundamentally changed, with a different property coming to exist instead. Due to this, unlike the previous views, dispositionalists think that if you had the same properties instantiated across possible worlds the laws would be identical. Only with different properties do you get different laws.

Nonetheless, this shouldn't concern the fine-tuning argument because even if laws are metaphysically necessary given the properties in the world, the instantiation of those dispositional properties is not, and this fact enables the argument to get going. Contingency has found another opening, with Schmass possibly being instantiated rather than mass. A further distinction therefore is needed between weak and strong necessitarianism. The weak necessitarian thinks "Laws concern properties. Properties may or may not exist in different possible worlds. . . . the law L(P) concerning property P is necessary, and that this requires only that L(P) holds in all possible worlds where P exists" (Bird 2004, 257). By contrast, strong necessitarianism says "there is no difference between possible worlds as regards their laws; nomologically, they are identical" (Bird 2004, 259). Since the dispositionalist position I have explicated doesn't decide between these positions, we must decide ourselves. In the section concerning the necessity of instantiation, I suggest how one might argue for strong necessitarianism, as it is required for the necessitarian response to fine-tuning.

2.2 Necessary Constants

Having seen why we could think that laws are metaphysically necessary, we must move onto constants. However, before proceeding I should note that there is often a terminological difference between physicists and philosophers here that can be confusing. In my reading in philosophy of science one rarely reads about the constants of nature as distinct from laws,[27] but this distinction often appears in discussions of fine-tuning and physics. Philosopher of physics Wallace is informative in explaining how we should understand this difference between the disciplines, writing,

---

[25] For further critical discussion, see Mumford 2004; Ellis 2001; Bird 2007.

[26] Some think of this directedness as relational in terms of an essential relation, whilst others think of it as non-relational. Either notion is acceptable for the necessitarian.

[27] One notable exception is Collins 2005, 388–391.

for most philosophers of science, a law of nature is something like the inverse-square law, *including the gravitational constant*. However, physicists usually regard the constants as parameters that can be set within the laws, leading to the distinction between constants and laws. But that doesn't in itself commit to the constants having any contingent status. I think it's best—when thinking about current physics, at any rate—to think of the constants as having the same nomic status as the laws.[28]

If this is correct, then perhaps many of those philosophers of science who embrace dispositionalism might also think the constants of nature possess the same type of necessity as the laws, since constants are contained within laws. This would be a quick and easy way to argue that the constants are metaphysically necessary, merely in virtue of the laws being metaphysically necessary. However, it is not one I suspect all will agree with, for instance Collins (2005, 388-389), and therefore, I attempt to spell out the metaphysics as to why dispositionalists might think constants are necessary, something yet to be done in the literature.

When explaining why the laws are metaphysically necessary on dispositionalism, I relied on the essential directionality inherent in dispositions. In order to explain the constants, I rely on another aspect of dispositions I take to be essential—their intensity (Manley and Wasserman 2007; Vetter 2015, ch.3).[29] It is clear that different dispositions have different intensities; for example, different acids have different pH levels, and different types of glass shatter more or less easily. Further, we can give parallel reasons for intensity being an essential aspect of dispositions as those we gave for directionality, particularly since "the degree or intensity of a power [disposition] is clearly a causally relevant matter" (Mumford and Anjum 2011, 26). Intensity, then, plays a key role in determining a property's identity, such that if the intensity of a property changed it would be a different property. For instance, if the pH level of a property changed, it would no longer be the same specific property because it would have a different dispositional essence.[30] Thus, just as directionality is essential to dispositional properties, so too is intensity, such that the same property cannot vary in its directionality or intensity across possible worlds.

---

[28] David Wallace in personal correspondence, 2017.

[29] Just as with directedness (footnote 26), how intensity is related to dispositions is disputed. If one thinks of it externally, because I later adopt holism, this shouldn't cause any problems. Alternatively, if one thinks intensity is intrinsic to dispositions, where this is how much effect a disposition has, one need not adopt holism.

[30] We might be able to say it is a similar property to be before since it might still have the pH level such that it is still acidic; however, different acids have different properties.

Given this, what are the constants of nature on a dispositionalist view-point?[31] The gravitational constant, for example, is the intensity of the relation between acceleration and mass. The same determinate mass accelerates at the same rate every time it is instantiated, but were the constant to change, this rate would be different. This relationship is fixed as a matter of necessity for mass and acceleration. The result of this is that wherever mass and acceleration are instantiated, we will have the same gravitational constant. That is, the gravitational constant will not have any contingent value, but rather a metaphysically necessary value given the dispositional natures of mass and acceleration. The only way for the constant to change would be if Schmass were instantiated, since then the ratios between acceleration and Schmass would be different to those between acceleration and mass. Constants, then, on this view are therefore nothing other than ratios of intensities between dispositional properties.[32]

Assuming this way of linking a disposition's intensity with the constants of nature, the constants turn out to be metaphysically necessary. Nonetheless, just like the dispositionalist position concerning laws of nature, the way to interpret the necessity of these constants comes in two varieties: weak and strong necessitarianism.[33] As before, strong necessitarianism, and hence necessary instantiation is required, and it is to this we now turn.

2.3 Necessary Property Instantiation

Dispositionalism gives us at least weak necessitarianism, but strong necessitarianism is required for a necessitarian response. That is, we need it to be the case that not only given certain properties certain laws and constants necessarily obtain, but also that the properties that determine the fundamental laws and constants are necessarily instantiated. As such, strong necessitarianism seems to require necessary property instantiation. Therefore, I here suggest how one might make the case for this aspect of the strong necessitarian position, given that this is a view that is embraced and defended by a number of contemporary thinkers.[34]

One argument some have made in favor of strong necessitarianism has been based on adopting a Platonic conception of properties. Thus,

---

[31] I owe the proceeding thought to Allen who comes close to explicitly endorsing this view elsewhere (2007, 113).

[32] Livanios (2014) critically discusses some problems for a dispositionalist view of constants but does not think of them as I suggest here.

[33] Dispositionalists may be asked further questions concerning the relationship between determinate and determinable laws and constants. This is something I bracket here but note that dispositionalists have sought to address this concern elsewhere (Tugby Unpublished manuscript).

[34] For instance: Bird (2004; 2007, 50–59; 2014); Wilson (2013; Unpublished manuscript); Bostock (2003); Oppy (2013b, 47); Smith (2001). The following list of scholars might also hold to strong necessitarianism, but their work leaves their adherence ambiguous: Leeds (2001; 2007); Edgington (2004); Vetter (2015).

Bird writes, "we should think of properties as themselves being necessary existents, as would be appropriate on the Platonic (*ante rem*) conception of universals. . . . If that is the case then . . . every possible property exists in every possible world, and so every possible law holds in every possible world" (2014, 285). What should we think of this type of reason? Whilst it seems Platonism happily accounts for laws and constants being the same in every possible world, it doesn't entail that the same worldly properties are instantiated in every possible world. The type of strong necessitarianism I require needs the further claim that a certain subset of the world's properties are necessarily instantiated. Platonism therefore gets us only halfway, providing necessary properties but not necessary instantiation, where reasons for adopting this missing element will be given shortly.

Another argument others have proposed for strong necessitarianism makes use of current debates over modal truthmakers. In recent years a new position has emerged which some have termed 'hardcore actualism' (Contessa 2010). This theory is actualist rather than possibilist, but distinguishes itself from 'softcore actualism' in that its modal truthmakers are natural objects rather than abstracta, such as states of affairs or propositions. Because of this, the view is often characterised as Aristotelian rather than Platonic, where the dispositionalist version has it that the dispositions instantiated in this world provide the truthmakers of all metaphysical possibilities.[35] On this view, what makes it true that I could have been a professional tennis player is that a whole complex array of dispositions in the actual world could have manifested in a way that brought this about. However, due to the Aristotelian nature of this view, those alien properties that are unable to be brought about by the manifestation of worldly instantiated dispositions, what Vetter (2015, 269) calls 'super-alien properties,' are deemed impossible. Thus, if the actual world contains dispositions that if manifested would produce a unicorn, then unicorns are possible. However, if the dispositions of this world are unable to bring about such a thing, then being a unicorn is a super-alien property and impossible. Some will no doubt be unhappy with such a consequence since they wish to allow for such super-alien possibilities, and thereby a greater range of metaphysical possibilities (Tugby 2015). Yet why should we allow for them? As Borghini and Williams write,

> The objection being raised is that dispositionalism is somehow inadequate as an account of metaphysical possibility because it does not treat *S* as possible [for instance the thought experiment those advocating the strong-external-governing conception of laws appeal too]. But why should it? Not every logically possible state of affairs will turn out

---

[35] For further explication of this view, see Jacobs 2010; Borghini and Williams 2008; Vetter 2015; Pawl 2017.

> to be metaphysically possible. The space of actual dispo-
> sitional properties divides the set of all logically possible
> states of affairs into two groups: those that are metaphys-
> ically possible and those that are not. . . . speaking of
> the possibilities we 'need' is very odd indeed. This implies
> that we know what is metaphysically possible, and that
> it is the task of an ontologically motivated account like
> dispositionalism to provide the truthmakers for that set of
> possibilities. This puts the cart before the horse. (2008,
> 37)

Additionally, many dispositionalists are unconcerned by the reduction of the modal landscape, since they claim that in order to adequately account for super-alien properties and be an actualist, one must employ abstracta to account for certain modal truths. Thus Vetter writes, "it is not too hard to bite the bullet here, since the bullet is part of an attractive picture of properties . . . [rather than] appeal to Platonist universals or propositions" (2015, 270). The super-alien properties complaint, therefore, does not seem to me to be an overwhelming worry,[36] although providing arguments to the effect that these properties are impossible would certainly strengthen the hardcore-actualist cause.[37]

Nonetheless, just as Platonism was incomplete in providing a strong necessitarian account, so too is hardcore actualism. Platonism required the extra thesis of necessary instantiation, because even though all properties exist across all possible worlds, the properties that are instantiated could vary. Hardcore actualism needs something similar since presumably there could have been fewer properties in the world,[38] and this might cause a problem for a strong necessitarian solution.[39] Therefore, we need some positive reasons for adopting a principle of necessary instantiation for those fundamental properties that determine nature's laws and constants.

One reason is due to the following thought. Suppose you think there should be a reason that these specific properties, and hence these particular laws and constants, are instantiated. It seems that holding that they are necessary gives a satisfactory answer to this question. The reason for this parallels the thought as to why necessity is an adequate response to the fine-tuning argument, namely because necessity is able to stop explanatory chains whilst positing brute contingents is not. Thus, if the instantiation of these properties is necessary, then asking why these properties exist is just like asking why God exists when He is metaphysically necessary. If, however, one were to adopt weak necessitarianism, the reason that these

---

[36] Dorr (2008, 47) makes a similar point for nominalists.
[37] Armstrong (1989) in the past tried to make an argument like this.
[38] Although Pawl (2017, 118–120) suggests this is questionable.
[39] Unless the properties remaining provide a very high probability for permitting life. Yet this provides a slightly different type of response to fine-tuning than the necessitarian one.

properties rather than others exist would be contingent, as if the reason were necessary it would make everything else within this chain of reasoning necessary.[40] But then we would be left with a brute contingent fact as to why these laws hold and not others. A theistic weak necessitarian might have an easy answer here if one grants that libertarian free acts can be explanation stoppers, since they might hold that it is in virtue of God's free decision that these properties are instantiated rather than others.[41] But non-theistic weak necessitarians, in order to avoid strong necessitarianism, will have to remain content with brute contingent instantiation.

Given that I'm trying to provide a response not based on brute contingency, necessary instantiation looks preferable if we think there should be a reason why these properties rather than others are instantiated. As Bird writes, strong necessitarianism provides "an explanation of sorts. Being necessary, the fundamental laws could not have been otherwise . . . we cannot ask for an explanation of the usual kind at all, for the comparative question, 'why do we have these laws as opposed to some other set?', assumes what is false, that some other set is possible" (2007, 59). Many theists should be on board with everything said here, other than the conclusion, since the motivation behind thinking properties are necessary is very similar to the motivation behind postulating God as an explanation of everything. Theists often complain about those who refuse to look for deeper explanations and instead posit contingent primitive brute facts. As such, they should welcome Bird's insistence that we dig toward deeper explanations. Further, since it is the principle of sufficient reason (PSR) that is doing the work in this argument, with this being something theists regularly rely upon, they should also look favorably upon this.

A second reason one might adopt necessary instantiation is based on another consideration prized by some theists and many contemporary metaphysicians—namely, simplicity or parsimony.[42] Strong necessitarianism is a simple view, particularly when considering the ontology of laws and constants, as only dispositions are needed. Further, as I will discuss below, if holism is true then it may be that only one dispositional property needs to be necessary since it will necessarily bring with it all the other properties, and as such there need only one necessary being, much like the monotheists necessary God.[43] There is also no need for differing types of

---

[40] Parallel to a common objection to the principle of sufficient reason (van Inwagen 1983, 202–204).

[41] For a defence of this, see Pruss 2006, 126–159.

[42] For instance, Schaffer (2015, 644) writes "*Do not multiply entities without necessity!* Few principles are as pervasive in contemporary metaphysics." In theistic debates, Swinburne (2004) is perhaps the greatest advocate of simplicity. I suggest the reason ontological parsimony is prized so highly is so to avoid postulating many brutes.

[43] Perhaps this goes someway to block Leftow's (2017, 328–332) thought that theists still have the advantage over the number and nature of fundamental entities when considering parsimony. For on both accounts there is only one in number and one in nature, with everything else being derivative on both accounts; for example, God's thoughts might be many

necessity on strong necessitarianism because there is no longer any physical or nomic necessity, and unlike weak necessitarianism no contingency related to the instantiation of those properties related to laws and constants. Thus, if simplicity is seen as virtuous, then strong necessitarianism is on solid grounds.[44]

A third reason for adopting necessary instantiation is that some think it avoids the notorious difficulties that plague modal epistemology.[45] Thus Wilson writes, for the strong necessitarian:

> Modal epistemology is continuous with ordinary epistemology. . . . Far from presenting a problem for modal [strong] necessitarianism, the unification of modal epistemology with general scientific epistemology that it involves is one of the strongest points in its favor. Modal [strong] necessitarians require no special epistemology for modal truths, and they need not rely on the problematic conceivability-possibility link. (2013, 665)

Given this virtue, we have another reason for preferring the strong necessitarian position to its weak necessitarian rival.

Holism also could provide one with grounds for thinking that if one fundamental property is necessary, then all fundamental properties will be due to the interdependence of properties. For as Schaffer writes, "If everything is internal$_{\text{essential}}$ related . . . Everything will be interdependent in a very strong sense—if one thing were to fail to exist, then everything would fail to exist" (2010a, 349). The position I spell out here doesn't require that everything is interdependent, but only that those things involved within the causal realm are—those things which account for the laws and constants of nature. I will have more to say about holism later, but for now it should be noted that holism fits incredibly well with a dispositionalist theory of things, and therefore this appeal should not be seen in any way as ad hoc.[46] Thus, for strong necessitarianism to work one might only need to think that one property is necessarily instantiated, perhaps space-time (Dasgupta 2016, 398), with holism carrying all the other required properties with it.

Given all this, necessary instantiation, and therefore strong necessitarianism, has a number of arguments in its favor, relying on considerations based on the principle of sufficient reason, simplicity, modal epistemology, and

---

and of a different nature to God but they are not fundamental. Nonetheless, it should be acknowledged that whilst adding holism to the account isn't a significant cost; it nonetheless has some cost.

[44] Wilson (2013, 660–661) argues that strong necessitarianism also has the virtue of simplicity when addressing the argument from sustaining counterfactuals, since the answer why the counterfactually nearest worlds tend to have the same laws as the actual world is simply because *all* worlds have the same laws.

[45] For elaboration of some of these difficulties, see van Inwagen 1998.

[46] There are many dispositionalists who are advocates of holism; for example, see Mumford 2004, 182–184; Williams 2010, 94–101.

holism. Maybe there are further reasons one could give for this view, and this is something I think deserves further investigation.[47] However, what should be noted here is that there are some sensible reasons for holding to necessary instantiation and therefore strong necessitarianism. As such, strong necessitarianism seems to be a plausible option concerning the modal status of the laws and constants of nature.

2.4 The Proposal Summarised

Summarizing, the proposal holds that the world is dispositional, at least in its causal aspects, and as such the laws and constants of nature are metaphysically necessary. Further, since we have seen that reasonable grounds can be given for adopting necessary instantiation we arrive at strong necessitarianism. This leads us to an alternative response to the fine-tuning argument. That is, despite its initial appearances the fine-tuning data couldn't have been otherwise because they are necessary, and as such the fine-tuning argument cannot get going given its reliance on contingency.

3 Inference to Best Explanation Fine-Tuning Arguments

How then does this response fare when a fine-tuning argument is formulated in terms of inference to the best explanation? Craig (2008, 161; 2003, 175) provides us with an example of a skeleton structure of this type of argument, which he formulates as follows:[48]

(1) The fine-tuning of the universe is due to either necessity, chance, or design.
(2) It is not due to necessity or chance.
(3) Therefore, it is due to design.

If the necessitarian response is successful then contra Craig, the best explanation will be necessity rather than design. I have already given some reasons for thinking necessity a good explanation, but no doubt others will give opposing reasons as to why design is better. Perhaps one reason for thinking design better is due to objections that can be raised against the necessity explanation. I now look at some of these.

One major objection to this view will be, 'but couldn't things have been otherwise?' The first thing to say is, yes things could have been otherwise given strong necessitarianism, although perhaps not as otherwise as many would like. If we adopt a libertarian view of freedom that endorses the principle of alternative possibilities, then it seems the world could have

---

[47] Wilson (Unpublished manuscript) has argued for strong necessitarianism based on the many-worlds interpretation of quantum mechanics. Vetter's (2015, 276) view also seems to lead to strong necessitarianism.

[48] Note that Craig inserts 'physical' before necessity in his construction, I have removed this since I'm interested in metaphysical necessity rather than physical.

turned out different from how it has.[49] Sure, all the laws and constants would be the same, but the choices made by free agents would produce a different world. Further, certain non-super-alien properties could have manifested: those that could arise from the set of necessarily instantiated properties.[50] Yet despite this, strong necessitarians should have no hesitation in admitting that possibilities are radically reduced on their view. However, it seems we can conceive of possible worlds where the laws or constants of nature are different. What should be said in response to this?

First, as the discussion over the differing metaphysics of laws of nature showed, there is radical diversity amongst philosophers over what can and can't be conceived of, and hence the range of possibilities there are. For instance, Humeans thought anything could follow anything.[51] Advocates of the strong external governing approach, by contrast, thought one could have the same properties with different laws, whilst dispositionalists rejected both of these thoughts since a property's identity doesn't vary across possible worlds. Ultimately, all these views cannot be correct, and thus, the conclusion to be drawn is that we can't always conceive what we think we can.

Second, we can draw a distinction between types of conceivability as Chalmers has done, such that some things are conceivable in some respects but not others. Thus, he distinguishes between primary and secondary conceivability, so that it is possible to say "there is a sense in which 'Hesperus is not Phosphorus' is conceivable, and a sense in which it is not. The first of these senses corresponds to primary conceivability, the second to secondary conceivability" (2002, 157). The former of these two, primary conceivability, concerns epistemic possibilities, and therefore, we can say that it is primary conceivable that the laws and constants have been different, just as it is conceivable that water is not H_2O. Nonetheless, secondary conceivability is different because it is based on the idea that we hold the character of the actual world fixed and "we consider and evaluate counterfactual possibilities in the subjunctive mood" (2002, 158). When conceiving in this way we come to see as Kripke did, that "there is no

---

[49] Another way one might get this result would be through adopting quantum indeterminism concerning laws, which Wilson (2013, 661) takes to be the best form of strong necessitarianism. There are broadly two indeterminist pictures one might give. One is a type of multiverse, perhaps given a many worlds interpretation of quantum mechanics, which is the type of strong necessitarianism Wilson thinks best (Unpublished manuscript). The other view thinks indeterminism does not give one a multiverse, but rather actuality just traces one of the many indeterminist branches that is possible. This latter view however may not be sufficient to block the fine-tuning argument, unless the argument is formed that the laws *possibly* give a life-permitting universe rather than *actually* do. This is because the indeterminism of the laws might result in the non-life-permitting possibilities of the laws, rather than the life-permitting possibilities, being realized.

[50] Perhaps one could get further permutations by employing Vetter's (2015) degreed notion of potentialities and formalism.

[51] Although this does not include logically contradictory anythings.

coherently imaginable situation, considered as counterfactual, that verifies 'Hesperus is not Phosphorus' " (2002, 159), and as such this possibility is not secondarily conceivable. It is in this latter respect that dispositionalists contend that the laws of nature and constants could not be conceivably different from what they are. Thus, there is still a sense in which strong necessitarians can claim the laws and constants are conceivably different, but another sense in which they are not.

Nevertheless, some still might contend that it is secondarily conceivable that the laws and constants are different. Here it will need to be pointed out that we are often mistaken over what we think is conceivable, with one reason for this reason being that isolating our conceptions in order to assess them is extremely difficult. For instance, Hume's idea that he could imagine something coming into existence without a cause needs to be isolated from other seemingly possible scenarios, such as being teleported or transported, and doing so seems extremely difficult.[52] Alternatively, it might be the converse that trips us up, in that we fail to see things holistically enough so as to see where essential dependencies lie. Our conceptual powers also seem in some way dependent on our knowledge, and hence, contradictions once hidden become obvious. For example, perhaps we thought that we could conceive of a mechanical wave, like a sound wave, being able to travel through a vacuum, but after receiving further information we come to see a hidden contradiction between mechanical waves and vacuums. Maybe then we think we conceive of the fact that no waves can travel through a vacuum, but upon further information we find out there is some type of contradiction here too, since electromagnetic waves can.[53] Conception then, is always open to hidden contradictions coming to light at some further time. All of this is to say that our powers of conception are by no means infallible, but actually highly fallible. Wilson makes this point well, writing, "whether it is conceivable that like charges attract depends on us, and on our conceptual apparatus. Whether the relation between properties and their powers is necessary depends not at all on us or on our conceptual apparatus, but on properties and powers themselves" (2013, 664). Put simply, modality neither knows nor cares about our conceptual powers, or our seemings.[54]

This can be seen forcefully in Heil's remarks about the apparent contingency of the world. He writes, "what is it to 'appear contingent'? What does contingency look like? . . . [If] all the worldly truths [were] absolutely necessary, everything would appear just as it does now. How [then] could appearances provide any sort of indication of contingency?" (2013, 171). Thus, how things actually are depends not at all on our conceptual apparatus and intuitions, since conceivability is a function of how we think.

---

[52] See Anscombe 1981a, 1981b, for further elaboration of this thought regrading Hume.

[53] Other more metaphysical examples could no doubt be given.

[54] Gendler and Hawthorne (2002, 6) put it like this, "on the face of it, the idea that conceivability is a guide to metaphysical possibility is extremely problematic."

Presumably if we had a different psychological make up, or mental powers, we would conceive of things somewhat differently, and perhaps end up thinking the world less contingent than many do today. Therefore, if we wanted to find out what is truly possible, we would have to overcome the limits of our conceptual faculties, somehow transcending them, endowing ourselves with a God-like power. Clearly this isn't possible. But then the question over whether things could have been otherwise, that is, whether there could have been different dispositions and hence different laws and constants, turns out to be one over whether we *ought* to believe that there could have been, the 'ought' here being the 'ought' of epistemological justification.[55] The strong necessitarian has given reasons for thinking we ought not think there could have been other laws and constants, based on dispositional properties, the principle of sufficient reason, simplicity, and modal epistemology. Those who propose design must do likewise—that is, give epistemological grounds for thinking we, with conceptual powers, are correct in thinking the laws and constants of nature are contingent, rather than just assuming it.[56] Given that many acknowledge that conceivability is unreliable in assessing possibilities (Hill 2016), this objection doesn't seem to me to be an easy knockout against strong necessitarianism.

Further, we can follow Bird and hypothesise a plausible reason as to why our powers of conception are unreliable. He writes, the "link between imagination and possibility is explained by the adaptive benefits of such a link . . . [and given this we] have no reason to suppose that such a link should be reliable in delivering accurate judgements when applied to esoteric cases such as the contingency or necessity of laws" (2004, 273–275). This suggestion seems parallel to the one Plantinga (2011, 307–350) makes in his evolutionary argument against naturalism. Plantinga solves the problem by suggesting God has made us in such a way that our faculties are aimed at truth, but for the many who don't think God exists or has done this, we might think that this provides us with a further, albeit weak reason, to think we are not reliable adjudicators of possibility through conception.

Theists should also be sympathetic to this thought, that we are not reliable adjudicators of possibility, since it is something they also emphasize. For instance, many theists think a universe consisting of sentient beings who forever suffer horribly and pointlessly against their wills is impossible. Yet as Leftow notes, this "makes perfect sense. So it *seems* to describe a genuine possibility" (2012, 120). But if God necessarily exists and is necessarily omnipotent, omniscient, and perfectly good, then this is no genuine possibility, and the same will be true for countless other prima facie

---

[55] Thanks to Ralph Walker for this point.

[56] Heil makes a similar point: "Why imagine that the idea that the laws could vary requires no defense? The fact, if it is a fact, that the laws would have been different, had things been different at the Big Bang, does not imply that the laws could have been anything at all" (2013, 176).

possibilities given God's necessary existence. Given this, many theists should have little to complain about with the strong necessitarian's insistence that conceivability isn't a reliable guide to possibility.

Another way to respond to this objection would be to adopt holism, and think everything is interdependent (Schaffer 2010a, 341–376; Williams 2010). This allows one to reject the thought that alternative modal possibilities can arise from free recombination (Armstrong 1989). As Schaffer puts it, "A disconnected pluralistic heap should be amenable to free recombination; failure of free recombination is thus the modal signature of an interconnected . . . cosmos" (2010a, 350). Since dispositions are usually thought of as interconnected and holistic,[57] holism might be seen as a natural consequence of dispositionalism, and therefore, this way of restricting the modal landscape shouldn't be seen as costly to dispositionalists, but rather exactly what they should expect (Ellis 2001, 249, 287; Schaffer 2010a, 362–365).

However, one might be concerned that this holistic response leads to monism, the view that there is only one substance. Suppose this implication is right; should it be considered problematic? I think not. One reason is that Schaffer (2009; 2010b; 2010c) has provided some plausible arguments to think Monism a viable option. But secondly, many theists shouldn't take monism, at least as Schaffer conceives of it, as problematic since they too make similar moves. We can see this by looking at what both mean by substance, and the consequences of these definitions. Schaffer defines a substance as "a fundamental and integrated thing. [Where] a thing is fundamental if and only if it depends on nothing further, and a thing is integrated if and only if it is not an arbitrary gerrymander but displays natural unity" (2013, 68). Descartes defines substance as, "a thing which exists in such a way as to depend on no other thing for its existence" (*Principles* I. 51, 177).[58] Given these definitions, Schaffer concludes that only the cosmos is a substance, whilst Descartes deduces there to be "only one substance which can be understood to depend on no other thing whatsoever, namely God" (*Principles* I. 51, 177). Thus, when one reads that "exactly one *substance*—one fundamental and integrated thing— exists. . .[where this is] compatible with the existence of any number of *dependent things*" (Schaffer 2013, 80), theists might be forgiven for thinking their position is being described, when in fact it is the entailment of Schaffer's monist conclusion. Hence, both accounts give us only one substance, the cosmos or God.

Nonetheless, both attempt to overcome the implausibility of this conclusion, with Descartes allowing for other substances by producing a watered-down notion of substance, writing, "In the case of all other substances, we perceive that they can exist only with the help of God's concurrence"

---

[57] See footnote 46.

[58] Citations to Descartes's *Principles of Philosophy* are "*Principles*," followed by section number, subsection number, and page number in Cottingham et al. 1988.

(*Principles* I. 51, 177). Schaffer makes a similar move, suggesting that for ordinary objects we "replace *substance* with *thing*, where a thing is a bearer rather than a property, surface rather than paint. A substance is a thing that just happens to have some special features, namely fundamentality and integration" (2013, 81).[59] As such, both theists and monists seem to hold a similar position concerning substances, and give similar answers to its unwanted consequences. Given this, some theists need different arguments against the monistic conclusion if they wish to attack holism, as they too rely upon similar reasoning when claiming God is the one and only fundamental entity. Monism, then, is perhaps not such an easy target.

One might object to strong necessitarianism on other grounds, namely that if the laws and constants are metaphysically necessary then scientific methodology of observation and experiment might seem unnecessary, with this thought to be an absurd consequence. However, the necessitarian will dispute this consequence. The reason for this is that the essences of dispositions which account for both the laws and constants are *a posteriori* necessary, and as such empirical investigation is vital to uncovering their nature. Finding out the exact nature of a dispositional property is extremely difficult, and so much experiment and observation is required in order to do this. Further, it has been argued by some that uncovering dispositional properties is what modern science is most suited to do (Cartwright and Pemberton 2013). As such, science is still required and metaphysical theorizing from the armchair is insufficient.[60]

Another objection against strong necessitarianism is based on arguing that necessity is not the type of thing that can be attached to property instantiation. One reason often given as to why God can be necessary whilst the universe not, is that God can exist in worlds where nothing physical exists, since He is incorporeal. By contrast, necessary instantiation, in my case, requires that at least some natural dispositional properties are instantiated in every world. Perhaps not many properties will be required, especially if there is a reduction of current physics into something simpler. Nevertheless, it does seem that some of these properties, if they are to explain the laws and constants, must be physical and yet exist necessarily. Thus, if there are metaphysically possible worlds where there are no physical properties, then the type of properties I require to be necessary cannot be.

Unless the strong necessitarian can come up with an alternative response to this problem, they will simply have to bite the bullet, and hold that all possible worlds contain something physical.[61] Or put another way, there are no metaphysically possible non-physical worlds. However, this

---

[59] Schaffer does this to get rid of the substance category altogether, but one needn't follow him in that.

[60] In addition to this most of those who advocate strong necessitarianism are philosophers who are very informed of, and interested in, accounting for scientific data and its methodology.

[61] Heil (2013, 174–176) notes that it is hard for us to imagine a world without space, yet space seems to have physical attributes; thus, perhaps this bullet isn't as bad as it might first

objection might be less worrying if we make a distinction between atheistic strong necessitarianism and theistic strong necessitarianism.[62] On the atheistic view, a bullet will be bitten, but on the theistic view it need not be. Before explaining why, I answer a worry some might have—namely, why I am invoking God whilst at the same time critiquing an argument to His existence. One shouldn't be concerned by this since one can object to an argument to *X* even though they think *X* exists. Indeed, it might even be that because *X* exists and exists in a certain way that they to object to the argument, with this being exactly the case here. For the strong necessitarian theist, much like Leibniz and Spinoza, the world and its structural features are necessary due to something in the nature of God. Perhaps this something is due to His simplicity, or perfection?[63] This move should make it clear why I am not concerned by an 'opportunistic theist' availing the PSR for himself in order to argue for God's existence.[64] The reason is simple: the paper is merely questioning whether the fine-tuning argument is a good one, not whether God exists.[65] Given God, the theist can claim that there is possibly a non-physical world, but that is only because there is a possible world where God does not create.[66] If God creates, however, then what He creates will necessarily be exactly the same dispositional properties that determine the laws and constants of our world.

This response is also useful in answering another objection alleged against the strong necessitarian response—namely, that it might seem to provide an answer to the question behind the Leibnizian cosmological argument: Why is there something rather than nothing? This was not my intention, yet the fact that certain properties are necessarily instantiated might provide a reply to this argument as well. The theistic strong necessitarian can once again claim that the necessity here is conditional on God's creating, such that the fine-tuned laws and constants couldn't be different from what they are at all, but there could have been a world just with God. Hence, the Leibnizian question still remains. The other response one could give, open to the atheistic or theistic view, is to distinguish between the

---

appear. Further, it might be that orthodox first-order logic, which assumes that at least one thing exists, can also come to the aid of those holding this view.

[62] However, combining theism with strong necessitarianism severely limits the modal powers attributable to God, such as many of those Leftow (2012) ascribes to God in the most comprehensive study of God's relation to modality.

[63] Perhaps the most influential work on this topic is Rowe 2004.

[64] Although non-theistic strong necessitarians might want to reject PSR-based reasoning since it might come to a theists aid. I should note that only Bird, out of all the strong necessitarians in the literature, argues for the view based on PSR, whilst all the others think there are other independent grounds good enough to endorse the view.

[65] Della Rocca (2010) has argued quite persuasively that the PSR leads one to a theistic necessitarianism.

[66] Although this rests on a controversial assumption that God might not create, and this too has been questioned by some theists. For instance, see Kretzmann 1988; O'Connor 2008, 111–122.

possibility of there being other possible worlds, and the possibility of there being no possible worlds. The thought here is that while it is true for strong necessitarians that in every possible world certain properties necessarily exist, there is still the possibility of nothing at all existing, where this is the possibility of there being no possible worlds. If either of these are correct, then the Leibnizian question remains. Therefore, strong necessitarians would still have further work to do in replying to Leibniz.

A final concern one might raise against the necessitarian view as the best explanation is due to thinking that necessities should not be thought of as good explanation stoppers (Leftow 2012, 51–54). The worry here is that these necessities seem brute, and some take brute necessities to be bad (Dorr 2004, 2008; Cameron 2010). For instance, it is thought that asking of something that is necessary, why it couldn't have been otherwise, is not a terrible question (Jubien 2009, 74–75). If a theistic strong necessitarian account is correct then we can see that there could be an answer as to why these laws and constants are necessary, namely because they bring about the best world and God can only bring about the best. Yet on the atheistic account there will be no further explanation as to why necessities hold, rather they are brute. However, theists who embrace the design conclusion but also object to the necessitarian response on these grounds may find themselves in a predicament. For Chalmers (2002, 189) takes it that the necessity of God's existence is a paradigm case of brute necessity, which Plantinga's (1967, 181–182) earlier comments would seem to bear out. Therefore, those theists who follow Plantinga appear to endorse brute necessities, and insofar as they find these sufficient explanation stoppers they too should find the strong necessitarian answer sufficient also to stop questions of explanation. Otherwise they will be guilty of double standards. Alternatively, some have sought to explain God's necessity, so that it isn't brute (Leftow 2012, 495–496).[67] These explanations, such as God is necessarily a perfect being, unfortunately don't seem applicable to necessary dispositions. As a result, an atheistic strong necessitarian must either deny that brute necessities are worrisome,[68] as many do, or find a way to explain their necessity further. By contrast, the theistic strong necessitarian can either explain the necessity so that it is no longer brute or follow the atheistic response. Nevertheless, since any form of strong necessitarianism is enough to block the argument this worry can be adverted.[69]

---

[67] However, Leftow (2017, 328–329) does think there is a sense in which God is brute—namely, that God is perfect. Yet he thinks that God is less brute than the bruteness of naturalism.

[68] To investigate this in detail would take us too far afield into the relationship between explanation and modality.

[69] For other objections and replies to strong necessitarianism, see the papers where it is defended in footnote 34.

As a result, I think the explanation of strong necessitarianism could plausibly be taken by some to be the best explanation in inference to the best explanation versions of the fine-tuning argument. I would favor the theistic version out of the two types, atheistic and theistic, but could understand why someone might favor the atheistic version, particularly if they have what they think are strong independent reasons for thinking God doesn't exist. I therefore suggest it isn't cut-and-dried that design is the best explanation here and that necessity, if it is a good explanation stopper, seems a viable contender, or at least one theists need to give more attention to.

4 Bayesian Fine-Tuning Arguments

The other way the fine-tuning arguments are formulated is in terms of Bayes's theorem (Collins 2009; Hawthorne and Isaacs 2017, 2018), where this contrasts with inference to the best explanation formulations.[70] The argument run this way can be stated as thinking that a life-permitting universe, which requires fine-tuning, is more likely on theism rather than on atheism. As such, the life-permitting universe confirms theism over atheism. The question for us is whether the necessitarian response is also effective in responding to this type of argument.

So to answer this question, it is vital to see that epistemic probabilities are essential for understanding the Bayesian approach, where these measure the degree of confidence we rationally should have in a proposition. This has a worrisome effect on the necessitarian response, since even if these specific laws and constants are metaphysically necessary, there is no argument for this claim that renders it highly probable or absolutely certain; this is because metaphysical necessities do nothing to render epistemic probability claims high or certain. This is made obvious when considering identity claims. For instance, Superman is Clark Kent. Nonetheless it seems Lois Lane should assign as a low epistemic probability that Superman is Clark Kent, even though it is metaphysically necessary that Superman is Clark Kent. Given this, the mere fact that the laws and constants are metaphysically necessary does nothing to block this form of argument.

This is made clearer when we set out the argument more precisely. Hence, take the argument for theism based on fine-tuning, where *T* refers to theism and *LPU* a life-permitting universe, to be as follows:

$$P(T|LPU) = \frac{P(T) \times P(LPU|T)}{P(LPU)}$$

Put informally, this means that the probability of theism given a life-permitting universe is equal to the probability of theism multiplied by

---

[70] Hawthorne and Isaacs (2018, 141–143) are critical of explanation versions of the argument compared with probabilistic accounts.

the probability of a life-permitting universe given theism, divided by the probability of a life-permitting universe. Here we are conditionalizing the probability of theism on the existence of a life-permitting universe, since we know there is a life-permitting universe as we live in one.[71] The place where the necessitarian response would come in is in trying to raise the probability of a life-permitting universe, *P(LPU)*, so to diminish the ratio between a life-permitting universe given theism and a life-permitting universe in general, *P(LPU|T)/P(LPU)*. If it were to do this, then it would diminish the confirmation that a life-permitting universe gives to theism. We can think of the general probability of a life-permitting universe, *P(LPU)*, as asking what the probability of getting this evidence is in general, where this is understood as a function of all the different ways we could get this evidence. For our purposes, we only need to plug in two mutually exclusive, but exhaustive ways this evidence could come about—one where strong necessitarianism holds and the other where it does not.[72] Thus, we can understand the probability of a life-permitting universe, where *N* refers to strong necessitarianism, as follows:

$$P(\mathrm{LPU}) = P(N) \times P(LPU|N) + P(\sim N) \times P(LPU|\sim N)$$

Put informally, the probability of a life-permitting universe is equal to the probability of strong necessitarianism multiplied by the probability of a life-permitting universe given strong necessitarianism, plus the probability of strong necessitarianism not holding multiplied by the probability of a life-permitting universe given strong necessitarianism not holding. What needs to be the case to render the probability of a life-permitting universe in general high, so to diminish the force of the fine-tuning argument, is that something in this formula makes it that the general epistemic probability of a life-permitting universe is high. Since we are considering the necessitarian response, we are interested in the first half of the formula. Here the necessitarian is likely to claim that *P(LPU|N)*, the probability of a life-permitting universe given strong necessitarianism is very high, perhaps even 1. Nonetheless, the epistemic probability of strong necessitarianism holding seems to be extraordinarily low. As such it does nothing to boost the overall probability of a life-permitting universe, *LPU*. For instance, suppose the epistemic probability of strong necessitarianism was 0.000001, then given that the probability of a life-permitting universe on strong necessitarianism is 1, the overall probability of this conjunct of the equation for the general probability of a life-permitting universe is 0.000001. We can see that

---

[71] Since we should only ever conditionalize on the most epistemically certain data, rather than mere possibilities, it is therefore highly likely that we should never conditionalize on strong necessitarianism, as it will never be the most epistemically probable thing available to us in fine-tuning arguments.

[72] These two categories can be split into many further subtypes, but this further division does not concern us here.

necessitarian responses will fail similarly for other types of data, too, and so this is not restricted to fine-tuning arguments. For example, suppose you come across some fingerprints at a crime scene, you might assign a certain probability for them being there in general. One reason they might be there is that the laws of nature make it necessary that this fingerprint be here. As such, the probability that the fingerprint is here given these laws of nature is 1, but the epistemic probability that these laws of nature necessarily entail this fingerprint is extraordinarily low. Given all this, we can see that metaphysical necessity does nothing to block the Bayesian argument which relies upon epistemic probability. Things therefore look grim for the necessitarian on this construal.

What then can the strong necessitarian say in response? One thing they might say is that once we see the world is as he claims, then Bayesian reasoning is undercut by necessitarianism, since the objective chance of the laws and constants being as they are is in fact 1. This may well be epistemically surprising, but any surprise we feel should lapse. Responding to this, one might think this is a big cost to pay, given how prevalent Bayesian reasoning is. However, the main problem with this response is that it just doesn't seem possible that we could know with anything close to certainty that strong necessitarianism holds. As a result, the response doesn't even get going.

Another route the strong necessitarian might try is claiming that Bayesian reasoning is problematic and so shouldn't be adopted.[73] Whilst some no doubt think this way, it is fair to say that it is a minority view and as such will be thoroughly unconvincing for most. Finally, perhaps the last hold-out for the strong necessitarian is if there are other devastating criticisms particular to the Bayesian formulation of the fine-tuning argument that do not plague the best explanation-style argument.[74] If there are, then the Bayesian version will need to be dropped for the best explanation formulation. The difficulty here is that the concerns which might be brought to bear against the Bayesian version seem also to potentially frustrate the inference to best explanation formulation as well. As such the strong necessitarian response doesn't seem to hold up well against Bayesian style fine-tuning arguments. At the most, it would seem to provide some reason for increasing our credence's that the laws and constants are necessary. Yet it doesn't increase these nearly enough for it to be problematic. We might therefore suggest that given strong necessitarianism is impotent against the fine-tuning argument formulated in Bayesian terms we have another reason, along with Hawthorne and Isaac's criticisms, to prefer this style of argument over the inference to the best explanation version.

To conclude this section, suppose we somehow came to know for certain that the laws and constants of the universe are as the strong necessitarian

---

[73] For some potential issues, see Easwaran 2011.

[74] For instance, Plantinga 2011, 219–224; Manson 2000; McGrew et al. 2003; McGrew and McGrew 2005.

supposes. As a result, the epistemic probability of this would be 1, and therefore as "epistemic probabilities are only useful in conditions of ignorance" (Collins 2005, 389) they are no longer applicable since we know for certain that the world is as the strong necessitarian claims. Still, we might be able to run an argument for theism based on this by asking whether it is likelier on theism than on atheism that there are necessary life-permitting laws and constants. I suggest it would be likelier on theism than on atheism, perhaps for some reasons mentioned above regarding God's perfection, and hence strong necessitarianism of laws and constants confirms theism over atheism.[75] The argument will be much weaker than the fine-tuning argument, but it is an argument to theism nonetheless.

5 Conclusion

The aim of this paper was to explicate and assess an alternative response to the fine-tuning argument. The strong necessitarian's response to the argument is simple—there couldn't have been any other laws or constants, since the laws and constants are metaphysically necessary, and the fine-tuning argument requires that they are contingent. Yet the efficacy of this response, as we have seen, depends on the way the fine-tuning argument is formulated. If given in terms of inference to the best explanation, I claim the response can be potent. Yet when given to a Bayesian formulation of the argument, the response seems impotent. As such, I suggest those formulating fine-tuning arguments should do so in Bayesian terms so as to avoid the difficulties of the necessitarian response.

Ben Page
Durham University
E-mail: benjamin.t.page@durham.ac.uk

References:

Allen, Sophie. 2007. "What's the Point in Scientific Realism If We Don't Know What's Really There?" *Royal Institute of Philosophy Supplement* 82 (61): 97–123. http://dx.doi.org/10.1017/S1358246107000161.

Anscombe, G. E. M. 1981a. "Times, Beginnings, and Causes." In *Metaphysics and the Philosophy of Mind*, edited by G. E. M. Anscombe, 148–162. Minneapolis, MN: University of Minnesota Press.

Anscombe, G. E. M. 1981b. "'Whatever Has a Beginning of Existence Must Have a Cause': Hume's Argument Exposed." In *From Parmenides to Wittgenstein*, edited by G. E. M. Anscombe, 93–99. Minneapolis, MN: University of Minnesota Press.

---

[75] Or in terms of inference to the best explanation: the best explanation of the necessity of the laws and constants is God.

Armstrong, David M. 1983. *What Is a Law of Nature?* Cambridge: Cambridge University Press.

Armstrong, David M. 1989. *A Combinatorial Theory of Possibility*. New York: Cambridge University Press.

Armstrong, David M. 1997. *A World of States of Affairs*. Cambridge: Cambridge University Press.

Armstrong, David M. 2010. *Sketch for a Systematic Metaphysics*. New York: Oxford University Press.

Bird, Alexander. 2004. "Strong Necessitarianism: The Nomological Identity of Possible Worlds." *Ratio* 17 (3): 256–276. http://dx.doi.org/10.1111/j.0034-0006.2004.00253.x.

Bird, Alexander. 2007. *Nature's Metaphysics: Laws and Properties*. New York: Oxford University Press.

Bird, Alexander. 2014. "Time, Chance, and the Necessity of Everything." In *Chance and Temporal Asymmetry*, edited by Alastair Wilson, 280–294. New York: Oxford University Press.

Borghini, Andrea and Neil E. Williams. 2008. "A Dispositional Theory of Possibility." *Dialectica* 62 (1): 21–41. http://dx.doi.org/10.1111/j.1746-8361.2007.01130.x.

Bostock, Simon. 2003. "Are All Possible Laws Actual Laws?" *Australasian Journal of Philosophy* 81 (4): 517–533. http://dx.doi.org/10.1080/713659759.

Cameron, Ross. 2010. "Necessity and Triviality." *Australasian Journal of Philosophy* 88 (3): 401–415. http://dx.doi.org/10.1080/00048400903213763.

Carroll, John W. 1994. *Laws of Nature*. Cambridge: Cambridge University Press.

Cartwright, Nancy and John Pemberton. 2013. "Aristotelian Powers: Without Them, What Would Modern Science Do?" In *Powers and Capacities in Philosophy*, edited by Ruth Groff and John Greco, 93–112. New York: Routledge.

Chalmers, David. 2002. "Does Conceivability Entail Possibility?" In *Conceivability and Possibility*, edited by Tamar S. Gendler and John Hawthorne, 145–200. Oxford: Oxford University Press.

Collins, Robin. 2005. "Fine-Tuning Arguments and the Problem of the Comparison Range." *Philosophia Christi* 7 (2): 385–404.

Collins, Robin. 2009. "The Teleological Argument." In *The Blackwell Companion to Natural Theology*, edited by William Lane Craig and J. P. Moreland, 202–281. Oxford: Wiley Blackwell.

Contessa, Gabriele. 2010. "Modal Truthmakers and Two Varieties of Actualism." *Synthese* 174 (3): 341–353. http://dx.doi.org/10.1007/s11229-008-9456-x.

Cottingham, John, Robert Stoothoff, and Dugald Murdoch. 1988. *Descartes: Selected Philosophical Writings*. New York: Cambridge University Press.

Craig, William Lane. 2003. "Design and the Anthropic Fine-Tuning of the Universe." In *God and Design*, edited by Neil A. Manson, 155–177. New York: Routledge.

Craig, William Lane. 2008. *Reasonable Faith*. 3rd edition. Wheaton, IL: Crossway Books.

Dasgupta, Shamik. 2016. "Metaphysical Rationalism." *Noûs* 50 (2): 379–418.

Della Rocca, Michael. 2010. "PSR." *Philosophers Imprint* 10 (7): 1–13.

Dorr, Cian. 2004. "Non-symmetric Relations." *Oxford Studies in Metaphysics* 1: 155–192.

Dorr, Cian. 2008. "There Are No Abstract Objects." In *Contemporary Debates in Metaphysics*, edited by Ted Sider, John Hawthorne, and Dean Zimmerman, 32–63. Oxford: Blackwell.

Dretske, Fred. 1977. "Laws of Nature." *Philosophy of Science* 44 (2): 248–268. http://dx.doi.org/10.1086/288741.

Easwaran, Kenny. 2011. "Bayesianism II: Applications and Criticisms." *Philosophy Compass* 6 (5): 321–332. http://dx.doi.org/10.1111/j.1747-9991.2011.00398.x.

Edgington, Dorothy. 2004. "Two Kinds of Possibility." *Aristotelian Society Supplementary Volume* 78 (1): 1–22. http://dx.doi.org/10.1111/j.0309-7013.2004.00112.x.

Ellis, Brian. 2001. *Scientific Essentialism*. New York: Cambridge University Press.

Fine, Kit. 2005. "The Varieties of Necessity." In *Modality and Tense*, edited by Kit Fine, 235–260. New York: Oxford University Press.

Frisch, Mathias. 2004. "Laws and Initial Conditions." *Philosophy of Science* 71 (5): 696–706. http://dx.doi.org/10.1086/425056.

Gendler, Tamar S. and John Hawthorne. 2002. "Introduction: Conceivability and Possibility." In *Conceivability and Possibility*, edited by Tamar S. Gendler and John Hawthorne, 1–70. New York: Oxford University Press.

Groff, Ruth and John Greco, eds. 2013. *Powers and Capacities in Philosophy: The New Aristotelianism*. New York: Routledge.

Hawthorne, John and Yoaav Isaacs. 2017. "Misapprehensions About the Fine-Tuning Argument." *Royal Institute of Philosophy Supplement* 81: 133–155. http://dx.doi.org/10.1017/S1358246117000297.

Hawthorne, John and Yoaav Isaacs. 2018. "Fine-Tuning Fine-Tuning." In *Knowledge, Belief, and God: New Insights into Religious Epistemology*, edited by Matthew Benton, John Hawthorne, and Dani Rabinowitz, 136–168. New York: Oxford University Press.

Heil, John. 2013. "Contingency." In *The Puzzle of Existence: Why is There Something Rather Than Nothing?*, edited by Tyron Goldschmidt, 167–181. New York: Routledge.

Hill, Christopher. 2016. "Conceivability and Possibility." In *The Oxford Handbook of Philosophical Methodology*, edited by Herman Cappelen, Tamar. S. Gendler, and John Hawthorne, 326–347. New York: Oxford University Press.

Jacobs, Jonathan. 2010. "A Powers Theory of Modality: or, How I Learned to Stop Worrying and Reject Possible Worlds." *Philosophical Studies* 151 (2): 227–248. http://dx.doi.org/10.1007/s11098-009-9427-1.

Jacobs, Jonathan. 2017. *Causal Powers*. Oxford: Oxford University Press.

Jubien, Michael. 2009. *Possibility*. New York: Oxford University Press.

Kretzmann, Norman. 1988. "A General Problem of Creation: Why Would God Create Anything at All?" In *Being and Goodness: The Concept of the Good in Metaphysics and Philosophical Theology*, edited by Scott MacDonald, 208–228. New York: Cornell University Press.

Kripke, Saul. 1980. *Naming and Necessity*. Oxford: Blackwell.

Lange, Marc. 2000. *Natural Laws in Scientific Practice*. Oxford: Oxford University Press.

Leeds, Stephen. 2001. "Possibility: Physical and Metaphysical." In *Physicalism and its Discontents*, edited by Carl Gillett and Barry M. Loewer, 172–193. Cambridge: Cambridge University Press.

Leeds, Stephen. 2007. "Physical and Metaphysical Necessity." *Pacific Philosophical Quarterly* 88 (4): 458–485. http://dx.doi.org/10.1111/j.1468-0114.2007.00303.x.

Leftow, Brian. 2010. "Swinburne on Divine Necessity." *Religious Studies* 46 (2): 141–162. http://dx.doi.org/10.1017/S0034412509990370.

Leftow, Brian. 2012. *God and Necessity*. New York: Oxford University Press.

Leftow, Brian. 2017. "A Naturalist Cosmological Argument." *Religious Studies* 53 (3): 321–338. http://dx.doi.org/10.1017/S0034412517000257.

Leslie, John. 1989. *Universes*. London: Routledge.

Lewis, David. 1983. "New Work for a Theory of Universals." *Australasian Journal of Philosophy* 61 (4): 343–377. http://dx.doi.org/10.1080/00048408312341131.

Livanios, Vassilios. 2014. "The 'Constant' Threat to the Dispositional Essentialist Conception of Laws." *Metaphysica* 15 (1): 129–155. http://dx.doi.org/10.1515/mp-2014-0009.

Lowe, E. J. 1999. *The Possibility of Metaphysics*. New York: Oxford University Press.

Manley, David and Ryan Wasserman. 2007. "A Gradable Approach to Dispositions." *The Philosophical Quarterly* 57 (226): 68–75. http://dx.doi.org/10.1111/j.1467-9213.2007.469.x.

Manson, Neil A. 2000. "There Is No Adequate Definition of 'Fine-tuned for Life'." *Inquiry* 43 (3): 341–352. http://dx.doi.org/10.1080/002017400414890.

Marmodoro, Anna. 2010. *The Metaphysics of Powers: Their Grounding and their Manifestations*. New York: Routledge.

McGrew, Timothy and Lydia McGrew. 2005. "On the Rational Reconstruction of the Fine-Tuning Argument." *Philosophia Christi* 7 (2): 425–443.

McGrew, Timothy, Lydia McGrew, and Eric Vestrup. 2003. "Probabilities and the Fine-tuning Argument: A Skeptical View." In *God and Design*, edited by Neil A. Manson, 200–208. New York: Routledge.

Mumford, Stephen. 2004. *Laws in Nature*. Oxford: Routledge.

Mumford, Stephen and Rani L. Anjum. 2011. *Getting Causes from Powers*. New York: Oxford University Press.

O'Connor, Timothy. 2008. *Theism and Ultimate Explanation*. Oxford: Wiley-Blackwell.

Oppy, Graham. 2013a. *The Best Argument Against God*. New York: Palgrave Macmillan.

Oppy, Graham. 2013b. "Ultimate Naturalistic Causal Explanations." In *The Puzzle of Existence: Why Is There Something Rather Than Nothing?*, edited by Tyron Goldschmidt, 46–63. New York: Routledge.

Oppy, Graham. 2016. "Conflict Model." In *Four Views on Christianity and Philosophy*, edited by Paul. M. Gould and Richard B. Davies, 21–47. Grand Rapids, MI: Zondervan.

Pawl, Timothy. 2017. "Nine Problems (and Even More Solutions) for Powers Accounts of Possibility." In *Causal Powers*, edited by Jonathan Jacobs, 105–123. New York: Oxford University Press.

Plantinga, Alvin. 1967. *God and Other Minds*. Ithaca, NY: Cornell University Press.

Plantinga, Alvin. 1974. *The Nature of Necessity*. New York: Oxford University Press.

Plantinga, Alvin. 2011. *Where the Conflict Really Lies: Science, Religion, & Naturalism*. New York: Oxford University Press.

Pruss, Alexander. 2006. *The Principle of Sufficient Reason: A Reassessment*. Cambridge University Press: 2006.

Rowe, William L. 2004. *Can God Be Free?* New York: Oxford University Press.

Schaffer, Jonathan. 2009. "Spacetime the One Substance." *Philosophical Studies* 145 (1): 131–148. http://dx.doi.org/10.1007/s11098-009-9386-6.

Schaffer, Jonathan. 2010a. "The Internal Relatedness of All Things." *Mind* 119 (474): 341–376. http://dx.doi.org/10.1093/mind/fzq033.

Schaffer, Jonathan. 2010b. "The Least Discerning and Most Promiscuous Truthmaker." *Philosophical Quarterly* 60 (239): 307–324. http://dx.doi.org/10.1111/j.1467-9213.2009.612.x.

Schaffer, Jonathan. 2010c. "Monism: The Priority of the Whole." *Philosophical Review* 119 (1): 31–76. http://dx.doi.org/10.1215/00318108-2009-025.

Schaffer, Jonathan. 2013. "The Action of the Whole." *Proceedings of the Aristotelian Society* 87 (1): 67–87. http://dx.doi.org/10.1111/j.1467-8349.2013.00220.x.

Schaffer, Jonathan. 2015. "What Not to Multiply Without Necessity." *Australasian Journal of Philosophy* 93 (4): 644–664. http://dx.doi.org/10.1080/00048402.2014.992447.

Simpson, William M. R. 2017. "Half-Baked Humeanism." In *Neo-Aristotelian Perspectives on Contemporary Science*, edited by William M. R. Simpson, Robert C. Koons, and Nicholas J. Teh, 123–146. New York: Routledge.

Sklar, Lawrence. 1984. "Comments on Malament's 'Time Travel' in the Gödel Universe." *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* 2: 106–110.

Sklar, Lawrence. 1990. "How Free are Initial Conditions?" *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* 2: 551–564. http://dx.doi.org/10.1086/psaprocbienmeetp.1990.2.193097.

Smith, Quentin. 2001. "The Metaphysical Necessity of Natural Laws." *Philosophica* 67 (1): 31–55.

Swinburne, Richard. 2004. *The Existence of God*. 2nd edition. New York: Oxford University Press.

Tooley, Michael. 1977. "The Nature of Laws." *Canadian Journal of Philosophy* 7 (4): 667–698. http://dx.doi.org/10.1080/00455091.1977.10716190.

Tugby, Matthew. 2015. "The Alien Paradox." *Analysis* 75 (1): 28–37. http://dx.doi.org/10.1093/analys/anu113.

Tugby, Matthew. Unpublished manuscript. "Determinable Laws." Last viewed 2018. Document File.

van Inwagen, Peter. 1983. *An Essay on Free Will*. Oxford: Clarendon Press.

van Inwagen, Peter. 1998. "Modal Epistemology." *Philosophical Studies* 92 (1): 67–84.

van Inwagen, Peter. 2015. *Metaphysics*. 4th edition. Boulder, CO: Westview Press.

Vetter, Barbara. 2015. *Potentiality: From Dispositions to Modality*. New York: Oxford University Press.

Williams, Neil E. 2010. "Puzzling Powers: The Problem of Fit." In *The Metaphysics of Powers*, edited by Anna Marmodoro, 84–105. New York: Routledge.

Wilson, Alastair. 2013. "Schaffer on Laws of Nature." *Philosophical Studies* 164 (3): 653–667. http://dx.doi.org/10.1007/s11098-012-9878-7.

Wilson, Alastair. Unpublished manuscript. "The Nature of Contingency: Quantum Mechanics as Modal Realism." Last viewed 2018. Document File.