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On Some Objections to the Powers-BSA

Abstract

This paper responds to Friend's (2023) critique of *the Powers-BSA*, a view according to which laws of nature are efficient descriptions of how modally laden properties (powers) are possibly distributed in spacetime. In the course of this response, the paper discusses the nature of scientific and metaphysical explanation, the aim of science and the structure of modal space.

Keywords: Aim of Science; Explanation; Laws of Nature; Modality; Powers; Systems

1. Introduction

The Powers-BSA is a philosophical account of laws of nature according to which laws *describe* how properties are (possibly) distributed in spacetime. Williams (2019) maintains that laws describe just the actual distribution of properties. Demarest (2017) and I (Kimpton-Nye 2017; 2021; 2022) maintain that the laws describe other possible property distributions too, where I am more restrictive than Demarest about which possible distributions the laws describe. This difference between how powers are actually distributed and their *possible* distributions and

the question of the extent of possible distributions that the laws describe is particularly relevant to the objections in sections 3 and 4 below.

One might worry that *descriptions* are tied to observation plus theory whereas *possible* distributions go well beyond this tethering and hence that there's something *oxymoronic* in the latter articulation of the Powers-BSA. The idea is simply that there are objective facts about how properties are possibly distributed which are metaphysically rooted in or explained by the natures of modally laden properties (powers) themselves, and the laws *describe* these possible distributions as opposed to explaining them, metaphysically or otherwise. This just *is* the hybrid Humean-unHumean nature of the view.

The unHumean ontology of powers is sometimes motivated by a desire to avoid scepticism and hence a certain science *unfriendliness* of the Humean view (see, e.g., Hawthorne 2002; Bird 2007). Another motive for powers is to deliver a resource in terms of which other phenomena of philosophical interest, such as laws of nature, (metaphysical) modality, causation, persistence, etc., may be explained (see, e.g., Bird 2007; Chakravartty 2007; Mumford and Anjum 2011; Vetter 2015; Williams 2019; Ingthorsson 2021; Tugby 2022). Once powers are admitted into one's ontology, it makes sense to invoke a metaphysically lightweight *descriptive* account of laws since all the metaphysical heavy lifting can be done by the powers themselves. Furthermore, the BSA in particular is attractive due to its ability to achieve continuity with actual scientific practise. The unHumean metaphysics of properties and the Humean descriptive conception of laws each enjoy independent motivation so, according to proponents of the Powers-BSA, it makes sense to combine these views.

That's the Powers-BSA in outline. Friend presents an intricate web of objections to the Powers-BSA which I shall do my best to untangle and respond to in the sections that follow.

2. Scientists Systematize

The desire to *systematise* is arguably what motivates (many) scientists in their daily work (cf. Cohen and Callender 2009, 3). Newtonian gravity, for example, applies to a diversity of physical phenomena from falling apples to planetary orbits, and though it was lauded for this strength, it was ultimately superseded by Einsteinian gravity which provided yet further systematicity by understanding gravitational phenomena in terms of the geometry of spacetime. When scientific theories are overly complicated or disunified, this is typically taken as evidence that something in the scientific picture of the world is missing or has gone wrong. The fact that quantum mechanics and general relativity have different domains of applicability, that they are *disunified*, is the driving force behind much foundational research in theoretical physics the aim of which is to come up with a less piecemeal description of the universe.

In various places, Friend (2023, 454, 456, 458, 472) claims that the Powers-BSA cannot *explain* why scientists systematize. Arguments for this claim are hard to discern but it occasionally seems as if it is meant to follow from and thus unify Friend's other objections, i.e., the thought seems to be that since the Powers-BSA succumbs to objections X, Y, Z, it cannot explain why scientists systematize.[1] But the connection between the other objections and an inability to explain why scientists systematize is not clear (to me anyway).

[1] For example, after sketching the objections in his introduction, Friend says "Granting that PBSAs *therefore* fail to provide powers theorists with a better explanation of why scientists systematise[…]" (Friend 2023, 454, my emphasis)

Fortunately, there is no need to decipher and respond to any arguments according to which the Powers-BSA cannot *explain* why scientists systematize because it is not reasonable to expect this of the Powers-BSA, or *any* account of laws. Explaining human behaviour is a paradigmatic example of an aim of psychology or neuroscience, for example. Of course, these disciplines are not clearly demarcated from philosophy, but if you think it's a good idea to ask a *metaphysician* what explains some aspect of human behaviour, you are barking up the wrong tree.

Maybe there is another sense in which to understand this explanatory demand along the lines of *rational reconstruction*. Given that scientists systematize, what's the world like such that this behaviour counts as rational? This is a question that I suspect the Powers-BSA is well equipped answer. The Powers-BSA shares with the original Humean BSA the idea that strength and simplicity, *viz*. *systematicity*, of description is constitutive of what it is to be a law of nature. It then includes an unHumean element of objective modal structure, rooted in physical properties and motivated by the broad desire to admit modality as a real, irreducible part of reality, as indeed science itself would seem to suggest is the case (e.g., Williamson 2016). So, in *systematizing*, i.e., looking for strong, simple descriptions of this modal structure, scientists are on the right track to acquiring knowledge of the laws. Indeed, this ability to make sense of science as a rational search for laws of nature motivates the Humean, *BSA*, element of the Powers-BSA; it allows the view to reap the theoretical metaphysical benefits of its realist *unHumean* element without the undue cost of rendering laws epistemically inaccessible via scientific methods (see, e.g., Kimpton-Nye 2021).

3. Sources of Explanation

What explains the distribution of properties throughout spacetime? Advocates of the Powers-BSA have, in theory, two distinct explanatory resources available to them: laws and powers (the Humean lacks the latter). Friend thinks that problems arise if either one of these sources of explanation is favoured over the other. He illustrates the worry with two examples:

> 1) Assume that the Powers-BSA contains a law, *L*, such that the events covered by *L* "have no explanation according to the modal character of the powers involved"(2023, 455), then we have a case of nomic explanation in the absence of an explanation in terms of powers.
>
> 2) Conversely, if there were a generalization, G, which followed from the modal nature of powers, but which did not meet the criteria for lawhood in the Powers-BSA, then any events entailed by G would have an explanation in terms of powers in the absence of nomic explanation. (Ibid, though I'm paraphrasing).

This potential (given the Powers-BSA) for a mismatch between the generalizations that flow from the essences of powers and the *laws* makes a "mess of scientific explanation", according to Friend, "since it will mean that the existence of a nomic explanation is not indicative of whether or not there is an explanation in terms of the powers themselves." (2023, 455).

In response to example 1, an advocate of the Powers-BSA will simply deny that it is possible for there to be a law, *L*, such that the events covered by *L* "have no explanation according to the modal character of the powers involved" (ibid). Events covered by *L* (for any *L*) are a subset of all the worldly events and all worldly events are ultimately explained by powers,

which "[explain] why things are the way they are, where they are, and when they are." (Williams 2019, 220).

Regarding Friend's example 2), it helps to recall the issue of which possible distributions laws describe. The more alternative possible distributions laws describe, the less likely it would be to find a generalization entailed by powers, but which was not a law. This is because, the more possibilities that are taken into consideration, the more likely it is that powers characteristic behaviours will be manifest consistently and systematically enough to warrant elevation to the status of law. So, versions of the Powers-BSA according to which laws describe other possible distributions besides the actual distribution of powers, seem less vulnerable to this concern.

Having said that, an advocate of the Powers-BSA should be open to there being explanations in terms of powers in the absence of any explanation in terms of laws. As above, laws (according to the Powers-BSA) are to be understood as tools for scientists insofar as they are interested in systematically organizing objective modal structure as best they can, where the latter may or may not be knowable (given our cognitive limitations) *in all its glory*. This way, the Powers-BSA grounds laws in the modal structure inherent in powers and makes laws knowable in principle, even if there happen to be contours of that modal structure that we cannot know. It is a straightforward corollary of this that there *may* be objective explanations in terms of powers that are not captured by the laws. This is a feature not a bug of the view. It embodies an acceptance of the idea that we may not in principle be capable of knowing everything. This is not to say that laws are completely untethered from the world since they ultimately concern its objective modal structure rooted in powers, even if they only approximate that structure. The Powers-BSA is an elegant reconciliation of humility regarding

the fundamental nature of reality with a commitment to the rationality and success of science understood as being *about* that reality.

4. Generating Laws

Traditional powers-based accounts of laws maintain that laws directly reflect the natures of particular powers (e.g., Chakravartty 2007; Bird 2007) rather than systematizing their possible distributions. In slogan form *laws flow from the essences of powers* (see Bird 2007, 46 for details). Classic problem cases for traditional powers-based accounts of laws are *global* laws, laws which are very general such as symmetry principles and conservation laws (Bigelow, Ellis, and Lierse 1992; Livanios 2010; French 2014; Ioannidis, Livanios, and Psillos 2020) and, more recently, functional laws have been shown to be problematic for the traditional view too (Vetter 2012). So, one might motivate the Powers-BSA on the grounds that it, but not the traditional view, can account for global laws and functional laws, indeed, I have pursued this line elsewhere (Kimpton-Nye 2023).

Advocates of the Powers-BSA and those of the traditional view *agree* that it is the modal natures of powers that are metaphysically responsible for how those powers are possibly distributed. So, all relevant parties agree that the laws, according to the Powers-BSA, are metaphysically explained in terms of the modal natures of powers. But the traditional view also said that the laws are explained in terms of the modal nature of powers, so the Powers-BSA can explain global laws and functional laws if, and only if, the traditional view can! Or so Friend's objection goes (Friend 2023, 464).

This objection fails to recognise that the innovation of the Powers-BSA is to yield the laws via a different *function* (which crucially depends on the range of possible distributions

systematized) than that employed by the traditional view. The traditional view takes as input to its law-generation function a description of the modal nature of a specific power, performs some formal logical manipulations on that description and outputs a law (Bird 2007, 46). The Powers-BSA takes as input how properties are (possibly) distributed throughout spacetime plus facts about our scientific standards of strength and simplicity and outputs the laws. It is thus possible that the traditional view and the Powers-BSA yield different laws due to their different law-generating functions. Indeed, the Powers-BSA will plausibly yield different laws depending on the range of different possible distributions systematized (see esp. Kimpton-Nye 2017 and section 3, above). This is analogous to how different mathematical functions, while being underwritten by the same structure of the natural numbers, can nonetheless generate different outputs within a possibility space constrained by that structure.

Another potential motivation for the Powers-BSA is that the traditional view, but *not* the Powers-BSA, counts certain generalizations as laws that we should not want to count as laws. In light of the previous discussion of the views' different law-generating functions, this would certainly seem to be a possibility. But according to Friend, this possibility is problematic for the Powers-BSA.

According to Friend, if the traditional view generated laws not recognised by the Powers-BSA, then the set of Powers-BSA laws should be understood as "lossy", perhaps in the sense that they leave out information about certain implications of the modal natures of powers, or are strictly speaking *false* in order to maximise simplicity. His concern is that this contradicts scientific practice which does not tolerate such loss of information or falsity. The examples that Friend provides to back up this idea are cases in which scientists are dissatisfied with an incomplete or inconsistent (and hence false) theory; the inconsistency between quantum

mechanics and general relativity, for example, motivates the search for a theory of quantum gravity.

But just because the Powers-BSA plausibly yields a system of laws that omits some information about the modal natures of powers and the modal facts that follow from these natures, it does not follow that any old loss will be tolerated by the Powers-BSA. And it certainly does not follow that the sort of loss abhorred by scientists will be admitted by the Powers-BSA.

As already emphasised, scientific standards play a crucial role in the Powers-BSA's law-generation function, hence it is reasonable to believe that the Powers-BSA will not engender a loss of information about the world that scientists themselves would not settle for in their theorising. Friend (2023, 463) fails to recognise a crucial motivation for the Powers-BSA, which is the desire to ensure the epistemic accessibility (in theory, at least) of laws via scientific methods (see in particular Kimpton-Nye 2017; 2021). The only information that the Powers-BSA will lose is information that is epistemically inaccessible to us via scientific methods, which is precisely how it ensures the epistemic accessibility of the laws via those methods. It has been argued that the traditional view risks rendering certain laws epistemically inaccessible to science (Williams 2019; Kimpton-Nye 2021). But plausibly it is an *aim* of science to deliver knowledge of (all) the laws. A crucial motivation for the Powers-BSA, then, is the belief that no *metaphysical account* of the laws of nature should risk yielding the result that science is irrational in that it aims at knowledge of the unknowable (see also sect. 2 above). So there really is no problem here and the Powers-BSA is well motivated by the desire not to want to include as laws any facts that are not epistemically accessible via science.

5. The Structure of Modal Space

Friend leverages the potential "lossiness" of Powers-BSA laws into an argument according to which the Powers-BSA presents a problematic picture of the relationship between nomological and metaphysical modality. Assume that the modal natures of powers imply the generalization *all Fs are Gs* and hence that it is necessary that all Fs are Gs. Assume also that "all Fs are Gs" is not a law according to the Powers-BSA, which is indeed left open given what we've said about the Powers-BSA's law-generation function. It now looks as if we have a situation in which it is nomologically *possible* but metaphysically *impossible* that there is an F that's not G. This goes against the common idea that nomological possibility is subsumed by metaphysical possibility.

There are various things one could say in response to this objection, I'll canvas two options briefly.

First, the objection assumes that nomological possibility reduces to logical consistency with the laws, and hence that nomological necessity is a matter of being logically entailed by the laws. This view of nomological modality has been disputed by various authors on the grounds that it fails to capture what's special about *nomological* necessity as opposed to necessity relative to non-nomic facts (*wombat* necessity, anyone?) and that it trivializes the necessity of laws themselves (e.g., Fine 2002; Wilson 2013; Leech 2016). Williamson (2016) goes even further and argues that this view of nomological modality is *inconsistent*, since it requires, for example, that 'Hesperus ≠ Hesperus' be logically consistent with the laws of nature (Williamson 2016, 463). Thus, Williamson suggests instead understanding nomological possibility as metaphysical compossibility with the laws of nature (ibid). Accordingly, the

Powers-BSA advocate could say that there are no metaphysical impossibilities that are nomologically possible since metaphysically impossible propositions are *a fortiori* not metaphysically compossible with the laws. While there may be an *appearance* of nomological possibility due to logical consistency with the laws, what seems nomologically possible is not and this is ultimately explained in terms of powers which are the source of metaphysical modality.

On the other hand, Bhogal (2020) positively endorses (in the context of a thoroughgoing Humean picture) the idea that nomological possibility is broader than metaphysical possibility, an idea which he motivates by appeal to the different *roles* of nomological and metaphysical *explanation*. The role of nomological explanation, according to Bhogal, is to unify whereas the role of metaphysical explanation is to limn structure; an idea very much in keeping with the Powers-BSA (see previous sections, above).

It is beyond the scope of this paper to argue for one of these responses over the other, but the point is that *either* option would seem in keeping with the Powers-BSA. Arbitrating this choice would be an interesting avenue for future research.

Friend goes on to add that the situation is problematic for the Powers-BSA since the regularity, all Fs are Gs, "supports counterfactual inferences, is invariant under all kinds of intervention, and can be used to plan effective strategies, make precise predictions, etc. and yet, according to PBSA, it is not a law" (Friend 2023, 471). But this just betrays a misunderstanding of the Powers-BSA since the whole point is that if a regularity, be it *all Fs are Gs* or whatever, could be "used to plan effective strategies, make precise predictions, etc." (ibid), i.e., if it were the sort of thing that scientists cottoned on to, then the Powers-BSA would plausibly elevate it to

the status of a *law!* We are assuming in the context of the objection about modal space that *all Fs are Gs* is not a law (though it does follow from the modal nature of powers). But this assumption cannot be maintained in conjunction with the assumption that "all Fs are Gs" "can be used to plan effective strategies, make precise predictions, etc.", since then it starts to look like a good candidate for a Powers-BSA law and hence a bad candidate for making the point about what the Powers-BSA implies about modal space.

Finally, Friend worries that the Powers-BSA allows the possibility of a situation in which it is necessary that all Fs are Gs and hence the counterfactual *if a were F then a would be G*, is true, and yet in which there is no *law* to support this counterfactual (Friend 2023, 471). This misunderstands received wisdom about the relationship between laws and counterfactuals, which is that *if* L is a law, then L supports certain instances of counterfactual reasoning; *not* if some counterfactual is true, then there must be a law that supports it. Consider: *if S were a sample of water, then S would be a sample of H2O.* This counterfactual is true but there is no *law of nature* supporting it, instead, it is supported by facts about the distribution of metaphysical necessity.

6. Conclusion

I conclude that this crock of objections leaves the Powers-BSA unscathed, though there is some interesting scope for future work regarding what, exactly, we should think the Powers-BSA implies about the relationship between nomological and metaphysical modality.

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