

Science-Guided Metaphysics

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1. Introduction

Though its very right to exist is regularly called into question by those proudly identifying as ‘scientistic’, it seems that metaphysics is very much alive and kicking in today’s philosophy of science. For the contemporary field is teeming with attempts to mine scientific theories for metaphysical conclusions – thus creating what is sometimes called ‘naturalistic’ metaphysics, ‘scientific metaphysics’, or (most explicitly) ‘science-guided metaphysics’ (SGM).¹ Philosophers have dug deep into our best contemporary physics, for example, in search of the world’s fundamental category, whether it be that of objects, structures, or events;² and as to which, if any, of the traditional conceptions of the nature of properties give the best interpretation of the fundamental quantities.³ Those same theories have been invoked to argue that the world is fundamentally holistic⁴, that it exhibits fundamental indeterminacy or vagueness⁵, and even that it is devoid of any fundamental entities at all⁶. The debate over whether modality is a fundamental or derivative aspect of reality – surely one of the most central questions in contemporary metaphysics – has in recent years largely morphed into questions of the interpretation of quantum mechanics, with some arguing on this basis that spacetime should no longer be regarded as fundamental.⁷ And those are just some of the metaphysical conclusions that have been reaped from physics: modern chemistry and biology have likewise been brought to bear on deep questions of identity, composition, and persistence.

This resurgence of metaphysics in the philosophy of science is in many ways only to be expected, given the developments the 20th century witnessed in both science and philosophy. For what made these changes in science truly revolutionary is the fact they entailed grand changes of world-view – changes in the sort of basic categories and concepts that metaphysics is typically tasked with articulating. And surely one enduring legacy of Quine’s philosophy is his thesis of the ‘continuity’ between metaphysics and science – the thesis that has probably done most to restore metaphysics to intellectual legitimacy from its positivistic nadir.⁸ No wonder, then,

¹ See e.g. Guay and Pradeau forthcoming.

² On structuralism, see e.g. French 2014; on events, a classic is Čapek 1984.

³ See e.g. Maudlin 2008, Chapter 4; Kuhlmann 2010.

⁴ See e.g. Maudlin 2008, Chapter 3.

⁵ See e.g. Bokulich 2014.

⁶ McKenzie 2011.

⁷ See e.g. Loewer 1996.

⁸ See Callender 2011 for a nice discussion of this rehabilitation and many other themes discussed below.

that metaphysics is back in vogue and often being developed in close contact with the sciences. However, since this fact about what kind of work is being done and with what frequency is presumably just an empirical fact about philosophers, the distinctively *metametaphysical* interest lies in the conceptual and normative aspects of the practice. What is ‘science-guided metaphysics’, precisely? And what value, epistemic or otherwise, pertains to it – both intrinsically and in comparison with other approaches? The latter question seems particularly pressing in light of the rash of papers that have appeared in the last decade or so arguing that contemporary metaphysics has gone badly awry in its *failure* to utilize the guidance of science. By choosing instead to ‘go it alone’ and produce ‘the kind of metaphysics that floats entirely free of science’⁹, the bulk of metaphysics has, in the eyes of the most vocal supporters of SGM, become ‘irrelevant’, ‘frivolous’, ‘pseudoscientific’, ‘sterile or even empty’ – in sum, an activity lacking in seriousness, self-awareness, or accountability to anything outside itself.¹⁰ Some have even been so impolitic as to state that it ‘fails to qualify as part of the enlightened pursuit of objective truth, and should be discontinued’¹¹, and – in the circles I move in at least – has largely been applauded for doing so.

This resurgence of science-guided metaphysics, then, has been accompanied by a deeply antagonistic meta-metaphysics – namely, the explicit contention that an alternative metaphysics conducted in a scientific vacuum isn’t worth wasting our time with. Let us, rather crudely, call this latter metaphysics – that operating without the guidance of science – ‘armchair’ metaphysics.¹² But since the most vocal critics of armchair metaphysics themselves engage in science-guided metaphysics, we can only assume that *that* activity, by contrast, *is* taken to have value. Let us express the conjunction of these views as the ‘normative claim of SGM’ (NC_{SGM}):

NC_{SGM}: Metaphysics has value, and as such ought to be conducted, iff it is guided by science.

Our focus in what follows will be on this normative claim. The central moral will be that, for all of this fighting talk, it is much harder to sustain a normative distinction between science-guided and armchair metaphysics than many advocates of the former would seem to believe. Three arguments will be advanced to this end. The first, concerning we might call the *conceptual problem*, addresses the content of the normative claim. Here the objection will be that the notion of ‘science-guided metaphysics’ is at present so nebulous that we are not able to state what it is that the normative claim prescribes, let alone evaluate it. The second, concerning what

⁹ Ladyman and Ross 2007, 9.

¹⁰ Layman and Ross 2007, vii; French and McKenzie 2015, 28; Ladyman and Ross 2007 17; Callender 2001, 34.

¹¹ Ladyman and Ross *op. cit* vii.

¹² See however Guay and Pradeau *op cit*. for how such loose ways of characterizing the intended counterpoint to ‘science-guided metaphysics’ can mask important distinctions.

we will call the *practice problem*, is that science-guided metaphysics routinely employs the deliverances of armchair metaphysics in the course of fleshing out its claims. As such, pending some major change in how they go about it, proponents of science-guided metaphysics cannot assert the normative claim without running into performative contradictions. The third concerns we will call the *progress problem*, which focuses on the fact that the science upon which contemporary SGM relies is overwhelmingly likely to be false, meaning that a metaphysics based on it is likely to be false also. Given that – unlike in science itself – there is also no clear sense in which metaphysical claims can at least be said to be ‘making progress’, the epistemic value of a present-day metaphysics that is based in current science becomes very difficult to discern.

That in any case is what I will argue here. It might help to state at the outset however that I myself think it would be bizarre to choose not to employ relevant, well-supported science in the course of engaging in metaphysical theorizing – indeed in the course of any sort of theorizing whatsoever. Thus while the thrust of the paper will be negative, my intention is more to direct science-guided metaphysicians as to where we might usefully place our efforts rather than to score points against the rival view (assuming that such dichotomies even make sense – something surely undermined by the arguments to follow). Furthermore, it strikes me as only appropriate that science-guided metaphysicians engage in self-criticism of this sort, given that the lack of self-reflection has formed the core of so much of their own critiques of armchair metaphysicians.

Since this debate is normative through and through, we begin by outlining in more detail the normative presumptions of science-guided metaphysics. From then on we assess the normative claim.

2. The norms of ‘science-guided metaphysics’

The normative claim of science-guided metaphysics embeds a pair of propositions: that SGM is an activity worth engaging in, and that any other metaphysics is not. Clearly each of these claims needs supporting. Let us call the argument for the former claim the ‘positive’ argument for SGM, and that for the latter the ‘negative’. While the negative argument has dominated the recent literature on naturalistic metaphysics, far less has been said regarding the positive. To my mind this imbalance is somewhat curious, given that the modern discipline has its roots in a movement whose whole political point was the elimination of metaphysics. However, the one positive argument that *is* offered, if only occasionally and in passing, is the most obvious one – namely, that which appeals to the sheer success of science. Insofar as we think that science is a reliable guide to the world, the thought goes, we can expect a metaphysics guided by it to be a reliable guide in turn. While we can take it as implicit in the very fact that SGM

exists, that this is the motivating thought is occasionally made explicit in the literature.¹³

As noted, however, much more ink – certainly much more memorable ink – has been spilled attacking the ‘armchair’ alternatives to SGM, and hence in outlining the negative argument. Now it must be said that the existing literature here is somewhat ambiguous as to the status of metaphysical inquiry on matters upon which science is silent (assuming that there are such things). For present purposes, we will assume that NCSGM addresses, at least in the first instance, only metaphysical theses whose subject matter ‘overlaps’ with that of a well-established science. So if metaphysicians are writing about the nature of fundamental properties, typically assumed to be physical in character, according to NCSGM the scientific theory describing those properties must be consulted in the course of our theorizing if it is to generate work of any value. Similarly for work theorizing relations of material composition, the persistence conditions of objects, the nature of colors and moral properties, and so on (and on). So the claim is that, where there is ‘overlap’ in this sense, metaphysics that fails to incorporate the relevant science deserves only to be ‘cast to the flames’.

Why is this? The basic complaint is methodological in character – namely, that there is no reason to think that the methods employed in armchair metaphysics are well-equipped to reveal the relevant facts about the world, and plenty of reason to think they do not. To understand these objections, it is helpful to have some examples of *a priori* approaches to some of the questions outlined in the opening paragraph (thus establishing overlap).¹⁴

*The existence of fundamental objects.*¹⁵ Ted Sider and Ross Cameron have argued that the world contains a fundamental level composed of mereologically fundamental objects. Despite the widespread assumption that the fundamental is physical, at no point is any physical theory consulted in the course of arguing for this claim. Rather, the views are defended on the grounds that greater ‘ideological parsimony’ or ‘unity’ would be exhibited by the resulting metaphysical theories than would be exhibited their anti-fundamentalist rivals. In each case it is stated without argument that such ‘virtues’ of theories enhance the likelihood of their truth.¹⁶

¹³ See e.g. Ladyman and Ross 2007, p. 7, p 35, and Chapter 1 *passim*; Maudlin 2007, Chapter 3, *passim*; Baker 2013, p. 265.

¹⁴ Note that in talking about ‘a priori metaphysics’ I am not thereby implying that this is produced by ‘a priori metaphysician’. Sider and Lewis, for example, have all engaged deeply with science at many junctures in their theorizing (cf. Nolan 2015).

¹⁵ This discussion has primarily assumed a problematic mereological conception of fundamentality, although the structure of the argument would seem to generalize.

¹⁶ I should point out that Sider, in a footnote, admits that appeals to simplicity are questionable, and especially so in philosophy. He states he ‘suspect[s] that principles of parsimony cannot be derived from more fundamental epistemic

*The nature of fundamental objects.*¹⁷ Ned Markosian defends the idea that what makes ‘simples’ – the ‘basic building blocks that are meant to be combined in order to form composite objects’ – truly ‘simple’ and hence fundamental is the fact that they are *maximally continuous* bits of matter.¹⁸ Roughly speaking, this means that they ‘occupy the largest matter-filled, continuous regions of space around’. Despite clarifying that it is, in particular, *physical* objects that are the target of the thesis, there is no consultation with physics as to whether space is continuous, whether fundamental matter is continuous, or indeed with anything that physics might have to say about what fundamental physical objects are like. Rather, the principal reason that this account of the ‘basic building blocks’ is to be preferred is that the main rival theory – according to which the fundamental objects are fundamental in virtue of being ‘point-sized’ – is inconsistent with our ability to ‘imagine a possible world in which there is only one physical object, a perfectly solid sphere made of some homogeneous substance.’ Thus substantive questions about the nature of fundamental physical objects are addressed not by consultation with physics, but rather with the content of our imaginations, together with the modal intuitions we experience concerning what our imaginations present to us.¹⁹

The denial of holism. In his statement of Humean supervenience – needed to ground the success of his reductive modal programme – Lewis postulates that the world resolves into a mosaic of fundamental physical properties all of which are pointwise instantiated and intrinsic. Little is offered in support of locality beyond that it is ‘inspired by classical physics’²⁰; and all that is said regarding their intrinsicity is that it is ‘plausible’ or ‘seems right’.²¹ But whatever fudges might be buried in this statement of what ‘inspired’ the view – think here of a cable TV drama ‘inspired’ by a true story – classical mechanics is certainly *not* a true story and subsequent theories strongly suggest that both assumptions are highly questionable. And while one could certainly object that the arguments concerning quantum non-locality etc. only came to prominence in the philosophical literature after Lewis had laid down his system, it remains that substantive claims about the nature of fundamental physics properties are simply asserted and this just seems problematic – not least because these assumptions lie at the fulcrum of the success of his system.

principles’. While the admission is in a sense laudable, it is not clear what is actually gained from it.

¹⁷ Again, the question has been primarily discussed in mereological terms, but here I cannot see how the argument would generalize.

¹⁸ Markosian 1998.

¹⁹ Note that Markosian explicitly acknowledges that such intuitions are ‘notoriously difficult to defend’. While (again) this concession is in a sense laudable, it is this difficulty that is precisely the issue.

²⁰ Lewis 1994, 474.

²¹ Lewis 1986, 61; Lewis 1983, 16.

While this list is obviously not exhaustive, these are all clear cases in which metaphysicians confidently argue, or even simply assert, that fundamental entities *assumed to be physical in character* are a certain way without ever bothering to consult any physics. Rather, an alternative methodology is employed, two features of which stand out. The first is the explicit appeal to intuition, or to what intuitively ‘seems right’ to the person making the claim. The second is a crucial appeal to ‘theoretical virtues’. There are furthermore reasons to think these examples are relevantly representative of methodology in metaphysics, for the literature is replete with further examples and quotations from metaphysicians stating that these strategies *just are* the core strategies of the discipline.²² The claim of advocates of SGM is that there is little reason to believe either strategy is reliable, and plenty to suggest that it is not.

Let’s take the reliability of intuitions first. It seems, first of all, that there is *no reason to think* that our impressions regarding what is possible – intuitions that, it is held, were acquired in our environment of adaptation – would be reliable in the unobservable domain.²³ Nobody today thinks that the claims of fundamental physics – such as regarding color confinement or mass oscillation – could be reliably revealed by intuition (thus explaining why we shell out huge sums for experiments), and there seems no good reason to think things are any different when it comes to the fundamental metaphysics of this physics. Indeed, if physics has any metaphysical implications whatsoever (and I’m not sure anyone would go on the record denying that), then any agreement between our metaphysical intuitions and the implications of a deeply unintuitive physics would have to be a mere matter of chance; following Gettier, then, they would presumably fall short of knowledge. More strongly still, it seems we have ample historical evidence to claim definitively that intuition is *not* a good guide to aspects of the world transcending our immediate experience. Whether it concerns the necessity of determinism, the logical properties of parallel lines or simultaneity relations, or the necessity of immutable objects, it seems that ‘appeal to intuition has a really, really bad track record’.²⁴ But while physics can employ experimental methodologies to circumvent our lack of reliable instincts when it comes to the deep structure of the world, it is not obvious that a metaphysics that is impervious to the deliverances of the lab has any analogous alternative.

While the objections to the evidential role of intuition (at least in the relevant domains) seem straightforwardly compelling, the strength of the argument against the appeal to virtues is less clean-cut. One certainly gets the impression from the critical literature that the appeal to virtues such as ‘simplicity’ and ‘unity’ by armchair metaphysicians is at the very least highly under-theorized and not subject to any measure of quality control, and that it has in effect become an in-house

²² See Kriegel 2013, Bryant 2013, Ladyman 2017.

²³ This has long been a theme in philosophy of science: see e.g. Shapere 1988.

²⁴ Howard ms, 10.

methodology lacking any independent rationale.²⁵ Now, admittedly one does find frequent appeals by armchair metaphysicians to the fact that such virtues are routinely invoked in the process of scientific theory selection; as such, the claim goes, they may be legitimately appealed to in metaphysical theorizing too.²⁶ However, many critics of metaphysics have taken pains to deny that this ‘continuity gambit’ works, largely on account of relevant disanalogies between scientific and metaphysical theories.²⁷ For example, Michael Huemer has argued that while we can show that ‘simpler’ theories with fewer free parameters may be better supported by actual data than those with more – on the grounds that those extra parameters could be tuned to agree with different configurations of properties than those given in the data, resulting in that data giving less of a probability ‘boost’ – it is hard to see how this argument could generalize to theories in which the ‘data’ to be explained is the far more general fact that ‘things have properties’.²⁸ Others have claimed that metaphysical – unlike scientific – theories are unlikely to differ significantly in the degree of virtue they exhibit, so that the question of their role in conferring differential likelihood does not even arise. Thus Kriegel, for example, claims that metaphysical theories are unlikely to exhibit significant parsimony differences, owing to the fact that they routinely make as many denials as they do assertions (Humeanism not being mere ‘quietism’ about modality, and so on).²⁹ Others still have argued that the role of virtues in scientific theory selection is grossly over-stated by metaphysicians, for it is in fact only empirical features that the scientific community regards as rational criteria for theory selection.³⁰ If this is the case, then there isn’t even a ‘continuity’ case to argue for.

This completes our whistlestop tour of the positive and negative arguments for SGM. In sum, the positive argument is that SGM may be expected to inherit the epistemic success of science. The negative argument is that the methods employed by the alternative are not fit for purpose. If these are sound, it would indeed seem that producing SGM is a valuable way to spend one’s time while engaging in armchair enquiry is not. However, both what SGM is, and why exactly it is more valuable than the alternative, turn out to be extremely difficult to articulate, and this for several reasons. What I will call the ‘conceptual’ problem and the ‘practice’ problem both exploit the fact that the methodology of SGM is not cleanly quarantined from that of armchair metaphysics, meaning that the negative arguments applying to the latter would seem to infect the former. The ‘progress’ problem, by contrast, questions the positive argument for SGM, by denying that the

²⁵ See e.g. Ladyman and Ross *op. cit* 16-17.

²⁶ See Sider, Hawthorne, and Zimmermann (2008, 7) and Paul 2012 for particularly explicit examples.

²⁷ This terminology is from Saatsi 2017 – a paper which criticizes the idea that inference to the best explanation may be relied on in metaphysics given the assumption it is employed in science.

²⁸ Huemer 2009, Section II.4.

²⁹ Kriegel *op. cit*, 21.

³⁰ Ladyman 2012, Section 4.

success science enjoys in describing the deep portions of the world can be expected to ‘percolate up’ to a metaphysics guided by it.

3. The conceptual problem

In order for the normative claim to be well-defined, we clearly need to be able to say something meaningful about the relata involved – namely ‘science’ and ‘metaphysics’ – and the ‘guiding’ relation that SGM advocates claim ought to obtain between them. But arguably nothing here is as clear as it needs be to bring about wholesale change in the discipline, and this has not gone unnoticed by apologists for *a priori* metaphysics. Thus in one attack on the naturalistic critique Williamson focuses on the relata concerned and the difficulties involved in defining ‘science’ in particular.³¹ Chakravartty, by contrast, presses that the ‘guiding’ relation is hopelessly ill-defined, and that any attempt to sharpen it up will likely sanction either both forms of metaphysics or neither.³²

Consider first of all Williamson’s objection – an objection which in effect resurrects the demarcation problem against the advocate of NC_{SGM}. For in order for their injunction to be well-defined they must specify what it is that they mean by ‘science’. But here a narrow course must be steered. Construe ‘science’ too selectively, and they risk ruling out logic and mathematics – clearly bodies of theory indispensable to metaphysics. Construe it too widely, however, and naturalism ‘loses its bite’.³³ All things considered it is better, he says, not to ‘be implicated in an equivocal dogma’. As such, rather than committing to adhering to ‘scientific theories’ in the course of producing theories of metaphysics, we should resolve to conduct philosophy with ‘a scientific spirit’ – meaning that it is *virtues*, such as honesty and rigor, that we elect to adhere to instead.

The advocate of NC_{SGM} will no doubt here protest that there is in fact something deeply *dishonest* about the way that many armchair metaphysicians go about their work (in the way that they pay ‘mere lip-service’ to science and so on).³⁴ But regardless of whether they are right about that, this challenge must be addressed by those committed to the normative claim if they are to have a claim at all. However – as philosophers of science will be well aware – the long and not entirely productive debate over the ‘problem of demarcation’ suggests there is no obvious way to do so. The naturalist might hope to avoid tackling the problem head-on by (a) finding

³¹ Of course, the question of how to define ‘metaphysics’ is another big can of worms, especially since (in the context of SGM) the traditional idea of metaphysics as definitionally devoid of empirical content is presumably off the table.

³² See Chakravartty 2017. (Note that this is rather a simplification of Chakravartty’s richer, voluntarist position.)

³³ Williamson 2013, 30.

³⁴ See Bryant *op. cit* for a powerful reflection on metaphysicians’ ‘false consciousness’.

some principled way to make an exception for fields, such as logic and mathematics, which are essential to reasoned enquiry in general and yet not obviously classifiable as ‘science’, or (b) insisting that we do not in fact need a general definition of ‘science’ to make the point that they want to make. For since metaphysics is very often concerned with the *fundamental* in particular, in most cases it is simply fundamental physics that is to be consulted – and that *physics* qualifies as science if anything does has been a fixed-point in the demarcation debate.³⁵ But this, alas, will not do: Craig Callender’s argument against the ‘flowing present’ view of time, for example, draws almost as heavily on psychology as it does on physics, and psychology is a field whose scientific status has perennially been regarded with suspicion.³⁶ At this point the naturalist might reach for Laudan’s response to the demarcation problem, holding that we should abandon the attempt to identify ‘science’ in favour of determining *that for which we have good evidence*.³⁷ But it’s not clear that this helps at all, for what counts as evidence in metaphysics is surely a core part of what is here in dispute.

To see this, consider now the ‘guidance’ relation advocates of NCSGM insist must hold between science and metaphysics, and that forms the focus of Chakravartty’s concerns. How are we to understand it? If all ‘guidance’ means is that a bit of science must be thumbed through prior to arguing for a metaphysical claim, SGM runs the risk of reducing to a sort of ‘corporate listening exercise’ – an exercise in which some science is ostensibly ‘consulted’ prior to the drawing of a conclusion that would have been drawn either way. More than this is presumably required by the normative claim, with the ‘guidance’ of science in some way *constraining* what can legitimately be inferred. However, it is widely believed – including by some of the leading protagonists in this debate – that science will generically *underdetermine* the relevant metaphysics.³⁸ If this is right, then some kind of ‘Goldilocks principle’ must operate here, such that science must have some non-trivial role in constraining the relevant metaphysics without any expectation that it will be uniquely constraining. But then what must the science be admixed with before we are entitled to draw metaphysical conclusions from it? What, in other words, counts as evidence in metaphysics, in addition to that which supports the scientific theories that have guided it?

A standard lore here is that ‘theoretical virtues’ – ‘nice-making’ features transcending empirical adequacy and logical consistency, such as ‘simplicity’, ‘elegance’ and so on – must at this point be appealed to.³⁹ Now clearly, if this is the

³⁵ Of course, the status of string theory may reasonably be thought to undermine this claim.

³⁶ Callander 2017.

³⁷ Laudan 1983.

³⁸ Eg. Bigaj and Wüthrich state that such underdetermination is exemplified in ‘virtually all cases where attempts are made to draw metaphysical lessons from physical theories’ (2017, 13).

³⁹ See Chakravartty 2017 for a recent statement of this sort of view.

case then we immediately face the question of what makes science-guided metaphysics in better epistemic shape than its armchair counterpart. For the criticisms of the role of virtues in metaphysical theory selection outlined above are, by and large, insensitive to whether the metaphysics involved is armchair or naturalistic; indeed, since at this point the science is presumed to no longer be playing any role, it seems there is no distinction that could be made here in principle. And if such appeals are viewed as deeply problematic in the case of armchair metaphysics, then the significance of the fact that in the science-guided case the theorizing *started out* as based in science is far from obvious. For is not a chain of reasoning only as strong as its weakest link?

If science routinely underdetermines metaphysics, then, whatever does the work in arguing for metaphysical claims is by definition outside of science, and the defender of NC_{SGM} faces the question of what makes SGM kosher and yet not its armchair counterpart. As I have argued elsewhere, however, it is unclear to me that the methodology of SGM does of necessity involve the weighing up of theoretical virtues at crucial inferential junctures.⁴⁰ To take just a couple of examples, Maudlin has argued that the idea that properties are universals is *inconsistent* with the local gauge structure of fundamental physics; I myself have argued that the thesis of ontic structuralism is *implied* by the same sort of gauge-theoretic considerations.⁴¹ While these arguments have (predictably) been criticized, it seems that the methodology employed by naturalistic metaphysicians does not, as a matter of fact, inevitably make appeal to ‘virtues’ over and above the compulsory empirico-logical constraints. Furthermore, it is often admitted that science can at least *delimit* the number of live metaphysical options.⁴² But if it can reduce this number, what in principle prevents it from decreasing to one?

These, then, are the questions we face. What does it mean to say ‘science guides metaphysics’? Can the relationship be determinative, or not? If not, what else must be added? And what would make the resulting metaphysics in better shape than that resulting from the armchair? Without a clear policy on these issues, the normative claim doesn’t have a clear meaning, let alone a justification.

4. The practice problem

The conceptual problem is posed to the very notion of ‘science-guided metaphysics’. But the meaning attached to metaphysical claims themselves is notoriously difficult to pin down, and there is *prima facie* little reason to think that the claims of SGM are in a different boat here. Take for example the core claim of structuralist metaphysics – the view that ‘*relational structure is ontologically fundamental*’.⁴³ The doctrine

⁴⁰ McKenzie 2018.

⁴¹ Maudlin 2007, Chapter 4; McKenzie 2016.

⁴² E.g. Bigaj and Wüthrich *op. cit.*

⁴³ Eg. Ladyman and Ross *op cit*, 145.

proposes that if we take modern physics – principally, quantum theory and relativity – sufficiently seriously, then we will have to regard the *category of physical objects* as a *derivative category*, in contrast to that of *structure*; or at the very least, that it can no longer be regarded as a category *ontologically prior* to relations and structure. Its adherents typically also hold that *identity facts* are *derivative* and that the world is profoundly *holistic* in that objects *ontologically depend* either on each other or on the relations between them. Needless to say, few of the terms just highlighted have an especially straightforward meaning. Nor is there anything remotely straightforward about how one would go about arguing for them. So what sort of strategies have structuralist metaphysicians invoked to sharpen up and support their claims?

The short answer to this question is that structuralists have largely adopted a strategy of *mining the existing metaphysics literature* for appropriate resources, followed by a process of *applying or adapting* those resources so as to suit their particular needs. Thus in order to articulate the core claim that structure is ontologically fundamental I have drawn heavily on Kit Fine’s writings on ontological dependence, and to argue that we can make sense of physicists’ ambitions to explain the fundamental I have plundered *a priori* work on ‘grounding’.⁴⁴ Conceptual work by Jessica Wilson on determinates and determinables has been employed by Steven French to articulate the fundamentality of structure over kind properties, and he has also invoked Ross Cameron’s theory of truthmaking to communicate how radical structuralists interpret physicists’ talk about objects while denying that they really exist. Similarly, Simon Saunders has appropriated Leibniz’s principle of the identity of indiscernibles, revamping it *à la* Quine and extending to allow discernibility with respect to relations, to demonstrate the identity dependence of objects on relations in the context of quantum mechanics. And David Lewis’ notion of ‘elite’ or ‘perfectly natural’ properties has been invoked in the service of showing that the core claim of epistemic structuralism is non-trivial.

There are many other examples that could be cited in this connection. But the key point for present purposes is that all these metaphysical packages that have proved useful to appropriate in structuralism were not only created independently of structuralism, but were moreover (by and large) developed independently of *any scientific considerations whatsoever*. Cameron’s version of truthmaker theory, for example, was developed to make sense of talk of tables and chairs, and Leibniz’ principle of the identity of indiscernibles was (obviously) articulated too early on to be informed by the quantum mechanics that it subsequently helped to illuminate. Furthermore, presumably naturalistic metaphysicians proceed in this way only because this division of labour is in some way advantageous to them. But whatever those advantages are, as a methodology it clearly poses problems for the advocate of NCSGM. For how can it be that armchair metaphysics has no value if it repeatedly proves highly useful for constructing the science-guided metaphysics that ostensibly

⁴⁴ See French and McKenzie 2012, 2015 for references to many of these examples of appropriation.

does? So long as the metaphysics of science takes its concepts ‘off the peg’ instead of making everything it needs ‘to order’, it seems the normative claim of science-guided metaphysics cannot be asserted without performative contradiction.⁴⁵

5. The progress problem

What I have called the ‘practice problem’ took aim at the negative argument for SGM – the argument to the effect that ‘there is no alternative’ to science-guided metaphysics. The progress problem, on the other hand, sets its sight on the positive support that can be given for it. This, recall, was the simple but *prima facie* compelling thought that since science succeeds in guiding us to facts about the deep structure of the world – or so we will assume – a metaphysics that is based on it may be expected to successfully describe the world also. In making such an assumption we of course take up the standpoint of scientific realism.⁴⁶ But as everyone versed in the realism debate knows, our realist statements must be appropriately hedged and qualified if they are to be defensible. For nobody thinks our current scientific theories are anything other than *approximately* true at best. Indeed, giving the vicissitudes of scientific history it isn’t far-fetched to think that they may still be *very far from the truth*. But constitutive of the realist stance is the idea that as we produce theories that are more and more empirically adequate, we are at least making *better approximations* to the truth, and hence *making progress* toward it. It is belief in this sequence of *ever better* approximations, and hence in *progress* transcending the empirical, that defines the thesis of ‘convergent realism’. And since ‘progress’ is itself a normatively loaded term, it is hard to deny that the truth of this belief would constitute a good, something of epistemic value.

How does this thesis about progress in science connect with the issue of the value of metaphysics? First and most obviously, if our belief in the truth-content of our current scientific theories is hedged in some way (as all contemporary realists will hold it must be), then presumably our belief in the truth-content of any metaphysics that is based in these theories must be hedged in some way also. But on the assumption that science is at least *making progress* towards a true description, it seems natural to assume that a metaphysics that is firmly based in that science may be expected to be making progress too. As Ladyman and Ross put it, while it must be conceded that ‘it could turn out that the best current metaphysics is substantially wrong’ since we still expect future scientific change, ‘to the extent that metaphysics is closely motivated by science, we should expect to make progress in metaphysics *iff* we can expect to make progress in science’.⁴⁷

⁴⁵ This argument is defended in more detail in French and McKenzie 2012, 2015.

⁴⁶ For some discussion of how metaphysics of science and the presumption of scientific realism intersect, see again Gauy and Predeau *op. cit.*

⁴⁷ Ladyman and Ross *op. cit.* 35.

The increasing explicitness in the metaphysics of science about the likely falsity of our theories is surely a laudable development.⁴⁸ But it also raises urgent questions about what the value of that metaphysics is. While there is much to say here, I will press only that the notion of progress in metaphysics remains gravely underdeveloped, as do the reasons for thinking that progress in science would render it likely.⁴⁹ For it seems, once again, that there are relevant disanalogies between each description of nature that would problematize such inferences. Recall in this connection that the thesis of ‘convergent realism’ is that science is making progress via its production of successively *better approximations* to the truth. And presumably progress may be inferred from science to metaphysics only if there are analogous senses of progress involved in each case. However, it seems that metaphysical theses are just not the sort of thing to which the language of approximation happily applies.

To see this, let us return – albeit briefly – to some of the metaphysical debates guided by current physics mentioned at the outset. As is typical, these are debates over what is *fundamental*. Now, given that we do not think that the theories involved are truly fundamental, we expect our metaphysics based in those theories to undergo change as well. (After all, if our metaphysics were not sensitive to such changes, it would be hard to even motivate SGM.) Thus the is that our current metaphysics can at least be viewed as an ‘approximation’ to that to which we will be guided in future. Suppose, then, that we are Humeans on the basis of current scientific theories. On standard renderings, this requires the belief that *all* the fundamental properties are *categorical*. Thus their opponents, the Anti-Humeans, believe that at least *some* fundamental properties are *not* categorical.⁵⁰ But what does any of this mean? Well standardly, to say that a property is categorical is to say it ‘has no essential or other non-trivial modal character’,⁵¹ and hence is ‘free from any modal commitment’⁵². And ‘modal commitment’ will be modeled in terms of the presence of a modal operator (box or diamond) in the analysis of the property. Now this presence clearly cannot be ‘approximated’, for such operators either appear in a definition or they do not. And should *any properties whatsoever* turn out not to be categorical then the anti-Humean – ie, directly opposing – position is automatically sanctioned. What, then, could it mean for the position taken by a Humean to be an ‘approximation’ to some other view?

It seems to me that the root of the problem here is that metaphysical theses tend to have a totalizing, all-or-nothing character, both in terms of their extension and in terms of how their core concepts are defined. Given this feature, the notion of approximation simply does not make any obvious sense as applied to claims of metaphysics – unlike the claims formed in the characteristically much less general

⁴⁸ See e.g. Williams forthcoming.

⁴⁹ The ensuring argument is outlined in more detail in McKenzie (forthcoming).

⁵⁰ See e.g. Bird 2007, 45.

⁵¹ Bird 2007, 67.

⁵² Schrenk 2016, 71.

and much more discriminating language of physics. For this reason, there is simply no obvious way to infer optimistic doctrines of progress in metaphysics from the presumed fact of progress in the sciences, *even if* that metaphysics is created in close consultation with the sciences. As such, what the value is in engaging in metaphysics at any point prior to the emergence of a final theory – that is, at times like now – emerges as distinctly unclear. At the very least, to my mind, it is an issue that cries out for further theorizing.

Conclusion

Contemporary metaphysics of science is replete with claims that metaphysics constitutes a legitimate activity if and only if it is guided by science – claims that seem initially compelling. But a closer look reveals that science-guided metaphysics is implicated in armchair metaphysics and its problems as well. Furthermore, in spite of their close proximity it is hard to see how science-guided metaphysics participates in the epistemic value we associate with the sciences themselves. To be clear, my claim is *not* that the issues discussed here have gone unnoticed by metaphysicians of science; nor is it the case that I regard it as settled that any of them are in principle intractable. The point is rather that there is no consensus on these issues and no obvious way out of the ensuing problems. In a sense this is heartening, for it shows that there is still much valuable work to be done in a field whose value has been put into question. But the lack of obviousness about how to respond in the face of these problems is hardly consonant with the supposed obviousness of NCSGM. Perhaps we naturalists ought to reflect more on this before writing manifestos, for the *n*th time, on the illegitimacy of armchair philosophy.

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