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TWO TYPES OF NATURALISM AND THE METAPHYSICS OF SCIENCE

Dos tipos de naturalismo y la metafísica de la ciencia

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Abstract

Metaphysics of science is a subfield of philosophy that seeks to answer metaphysical questions—questions about what the world is like—in a way that is informed by our best science. But informed how, exactly? In what follows I will spell out two important ways in which we might make the relationship between metaphysics and science more precise. More specifically I will spell out two different types of *naturalism* to which a metaphysician might subscribe. I will then argue that these two different types of naturalism are importantly related, and that once this relationship is appreciated, it has implications not just for how we tackle particular metaphysical debates but also for how we think about the scope of metaphysics of science in general.

Key words: Metaphysics; Science; Naturalism.

Resumen

La metafísica de la ciencia es una subdisciplina de la filosofía que busca responder preguntas metafísicas —preguntas sobre cómo es el mundo— de una manera informada por nuestra mejor ciencia. Pero, ¿informada cómo, exactamente? A continuación, detallaré dos formas importantes en las que podríamos hacer más precisa la relación entre metafísica y ciencia. Más específicamente, detallaré dos tipos diferentes de *naturalismo* a los que un metafísico podría suscribirse. Luego argumentaré que estos dos tipos diferentes de naturalismo están relacionados de manera importante, y que una vez que se aprecia esta relación, tiene implicaciones no solo sobre cómo abordamos debates metafísicos particulares, sino también sobre cómo pensamos el alcance de la metafísica de la ciencia en general.

Palabras clave: Metafísica; Ciencia; Naturalismo.

Metaphysics of science is a subfield of philosophy that seeks to answer metaphysical questions—questions about what the world is like—in a way that is informed by our best science. But informed how, exactly? Are we, as metaphysicians of science, using science as a starting point, but nothing more? Or does science in some way exhaust the appropriate topics of inquiry for a metaphysician of science? And when we talk about

science, what aspects of that broad and heterogeneous area of inquiry are relevant? Although the metaphysics of science is a growing field, there has been surprisingly little detailed scrutiny of these questions. This is especially surprising since it is often assumed that metaphysics of science is in better standing than more traditional metaphysics precisely because of its often only vaguely defined relationship with science.

In what follows I will spell out two important ways in which we might make the relationship between metaphysics and science more precise. More specifically I will spell out two different types of *naturalism* to which a metaphysician might subscribe. I will then argue that these two different types of naturalism are importantly related, and that once this relationship is appreciated, it has implications not just for how we tackle particular metaphysical debates but also for how we think about the scope of metaphysics of science in general. In fact, I will argue that once the relationship between these two types of naturalism is fully appreciated, all metaphysics can and should be considered metaphysics of science at least in the following sense: all metaphysicians, regardless of the particular topics or debates in which they are interested, can and should engage seriously with important scientific considerations.

This result is surprising. The current practice of metaphysics is structured in a way that assumes there are some debates where science is relevant, and some where it is not. When one is investigating the nature of time or chance or laws, for instance, it's natural to think that one must be sensitive to scientific considerations. But if one is working on the existence and nature of haecceities, or the necessary and sufficient conditions for composition, or the status of metaphysically possible worlds, such considerations are usually assumed to be irrelevant. If I'm right, however, then philosophers working on these latter topics are just as beholden to scientific considerations as those working on the former.

Indeed the result is even more surprising once we recognize that metaphysical questions crop up all over philosophy—and are discussed by many philosophers who don't put 'metaphysics' on their curriculum vitae or think of themselves as metaphysicians at all. A metaphysical question is just a question about what the world is like. So when ethicists argue about the nature of right and wrong, they are arguing about a metaphysical question, and when aestheticians argue about the persistence conditions of works of art, they are too. The same goes for political philosophers debating the nature of race and gender, philosophers of mind arguing about the reduction—or lack thereof—of mental states to physical states, and philosophers of religion arguing about the existence of God. With respect to all these questions, too, I will maintain that anyone who takes a stand

in these debates is required to engage seriously with important scientific considerations.[1]

In these ways, I expect the arguments below, taken as a whole, to be quite provoking. So before I begin, let me make at least one small conciliatory gesture. Above, I claimed that there is no clear consensus about the precise relationship with science that is required in order for some particular discussion or position to count as a part of metaphysics of science. At the same time, my experience is that at least some of my readers have a fairly strong personal views on the point, and I don't really want to end up arguing about semantics. So, while above I said that the upshot of my argument will be that *all metaphysics can and should be considered metaphysics of science*, those who have strong views about the term 'metaphysics of science' can feel free to think of that upshot instead as *all metaphysics can and should be considered naturalistic metaphysics*. All the same substantive consequences will follow.

1. Two Types of Naturalism

To be a *naturalist* is to take science to be a paradigm of successful inquiry into what the world is like.[2] Naturalism, on this definition, is not a single position but a family of views. Distinct varieties of naturalism can be generated by varying the nature of the respecting relation—that is, by varying the strength of the constraint that our best science creates—and also by varying the aspect of our best science that is relevant to that constraint.

In what follows I will focus on two particular varieties of naturalism.

> *Content naturalism.* Metaphysicians should not accept theories that conflict with the content of our best scientific theories.
>
> *Methodological naturalism.* Metaphysicians should, whenever possible, use the same methodology that scientists use.

[1] Indeed philosophers who are skeptical of traditional metaphysical questions in general (who think they are merely linguistic or that they are in some other way pseudo questions) may still appreciate the consequences that follow insofar as scientific methodology can significantly impact metaphysical questions as they arise in a range of other subfields of philosophy. Thanks to an anonymous referee for this point.

[2] In using the term in this way I am following, among others, Sellars (1963, p. 173), who wrote that "in the dimension of describing and explaining the world, science is the measure of all things", Liston (2007), who says that naturalism is "a blanket term for numerous vague stances that include a pro-attitude toward science' and Papineau (2021), who says that the traditional goal of naturalists was to "ally philosophy more closely with science."

Both of these views take some spelling out. Let's start with content naturalism.

Content naturalism

According to content naturalism, philosophers who are investigating questions about what there is and what it's like ought not accept theories that conflict with the content of our best scientific theories. If our best scientific theories say that the fundamental laws are indeterministic, for instance, then metaphysicians ought not accept a theory that commits them to determinism. If our best scientific theories say that there is no objective distinction between the present on the one hand and the past and future on the other, then metaphysicians ought not accept a theory that commits them to there being such a distinction.

Of course it can sometimes be difficult to determine what the content of our best scientific theories in fact is.[3] The first example above is a case in point—the various interpretations of quantum theory in fact leave it very much open whether the world is indeterministic or deterministic. But that should not worry the content naturalist. Content naturalism does not commit one to thinking that the content of our best scientific theories is always, or even often, clear or settled. Insofar as the content of our best scientific theories *is* unclear or controversial, it will just be unclear or controversial what a content naturalist should believe. Since our best scientific theories in fact leave it open whether the world is indeterministic or deterministic, the content naturalist is not required, in virtue of her content naturalism, to adopt one view or the other.

It is also wholly compatible with content naturalism that one accepts a metaphysical theory that *appears* to conflict with the content of our best scientific theories. A standard interpretation of special relativity requires that there is no objective distinction between the present on the one hand and the past and future on the other. But a content naturalist can still put forward a view on which there is such a distinction. She just needs to have good reason for thinking that the standard interpretation is misleading, and that the true content of our best scientific theories is in fact compatible with her favored metaphysical view.[4]

Note also that content naturalism does not commit one to thinking that there is no work left for the metaphysician to do besides sorting out

[3] See French (1998, 2000) on what he calls the 'underdetermination of metaphysics by physics'.

[4] This is how I read Markosian (2004).

the content of our best scientific theories. Insofar as there is more than one candidate metaphysical theory that does not conflict with our best science, the content naturalist may well argue for one of those candidate theories over the others. The grounds for such an argument may even be themselves naturalistic (perhaps one of the candidate theories maps onto or otherwise connects with the content of our best scientific theories in a more straightforward way or has some other naturalistic virtue) or they may be wholly a priori (perhaps one of the candidate theories is just "more intuitive", whatever that means). Content naturalism itself is neutral on the existence and legitimacy of such grounds as long as they do not generate results that conflict with the content of our best scientific theories.[5]

Content naturalism strikes most contemporary philosophers, especially those with an interest in metaphysics of science, as pretty obvious. Most of us are familiar with objections to various metaphysical positions on the grounds that they conflict with our best scientific theories—and recognize these as some of the most serious objections a metaphysician can face. Such objections are never met with a simple shrug. Either the metaphysician in question attempts to revise their favored theory in order to avoid the apparent conflict, or they attempt to reinterpret the content of the relevant science in order to do so. Indeed, examples of this dialectic playing out in the contemporary literature abound. (Think of philosophers of time worrying that presentism is incompatible with special relativity.[6] Or political philosophers claiming that biological essentialist theories of race are incompatible with our best genetic theories.[7] Philosophers of perception argue that naive realism is ruled out by contemporary vision science.[8]) But the reader should note that the cases that get discussed in the literature are ones that are at least a little controversial—in particular they tend to involve cases where the content of our best science is at least somewhat unclear, and therefore there is room to maneuver in response to the objection that there is a conflict with our best science. Perhaps even better evidence of the importance of content naturalism in contemporary metaphysics are the many possible metaphysical positions that aren't

[5] It is worth noting that I am making an assumption here that the content of our best science does not itself include a *totality clause*—a claim that says that nothing further is true beyond what appears in the content of our best science. I take this to be a plausible assumption, at least for science as it currently is practiced. Perhaps a future theory of everything would contain such a clause.

[6] Putnam (1967), Hinchliff (2000), Sider (2001), Saunders (2002), Markosian (2004), Hawley (2009).

[7] Appiah (1996), Mills (1998), Zack (2002), and Mallon (2006).

[8] McDowell (2010, 2013), Burge (2011), and Fish (2021).

currently taken at all seriously because they so clearly conflict with our best science. (Historical examples are especially persuasive here—consider, for instance, the Aristotelean theory that everything is made of four elements, earth, air, fire, and water.)

Of course, many philosophers have had their naturalistic *bona fides* questioned. Indeed some have contended that the majority of contemporary metaphysics takes place without sufficient input from science.[9] But again, one must be careful to distinguish between (i) someone who is putting forward a theory that *by their own lights* conflicts with our best scientific theories, (ii) someone who is putting forward a theory that conflicts with standard interpretations of the content of our best scientific theories but only because they are oblivious to those standard interpretations, and (iii) someone who is putting forward a theory that conflicts with standard interpretations of the content of our best scientific theories but precisely because they think the standard interpretations are incorrect. There might be good reason to criticize those in the second and third groups. But only the first group would be in violation of content naturalism. There are few if any contemporary philosophers who take such a position.[10]

Methodological naturalism

What about methodological naturalism? Contemporary philosophers as a whole seem less clear about what precisely this position entails and whether they should adopt it. This unclarity has several different sources. First and foremost, philosophers without a lot of prior exposure to discussions of scientific methodology are sometimes confused about how methodological naturalism could be impactful at all. When one thinks of the methodology of science one thinks of telescopes and chemistry beakers and lab notebooks overflowing with data. One thinks, in other words, of complex experimental set-ups, data collection, and statistical analysis. What bearing could any of these methodological approaches have on philosophical debates? Perhaps methodological naturalism is true, this line of thinking goes, but even if it is, it doesn't have any impact.

[9] This position is perhaps best represented by Ladyman and Ross (2007).

[10] Indeed the only example that I can find of a reasonably contemporary philosopher who straightforwardly and fully rejects content naturalism is George Bealer, who claims, "Insofar as science and philosophy purport to answer the same central philosophical questions, in most cases the support that science could in principle provide for those answers ls not as strong as that which philosophy could in principle provide for Its answers. So, should there be conflicts, the authority of philosophy in most cases can be greater in principle" (Bealer 1996, p. 81).

The key problem with this line of thinking is that the methodology of science in fact involves more than just the collection and analysis of data.[11] We can think of those aspects of the methodology as the *empirical* aspects. They are vital in the sense that they provide an initial and unavoidable constraint—one cannot accept a theory that is not compatible with the data one has collected (unless one has some reason for thinking that the data one has collected is misleading). But the empirical aspects of scientific methodology are not exhaustive. There are often (if not always) multiple candidate theories that are compatible with the data one has collected.[12] Any choice between these theories will be made on extra-empirical grounds.

What kind of extra-empirical reasoning plays a role in science? The most straightforward approach—and the one that I will focus on here—is to think of extra-empirical reasoning as comprising various principles that guide scientists in choosing between competing, empirically adequate theories.[13] Paradigm examples of extra-empirical principles that are often thought to play some role in scientific methodology are principles like Occam's Razor, according to which we should choose the simplest theory that is empirical adequate, or Inference to the Best Explanation, according to which we should choose the empirically adequate theory that best explains the data. For various reasons (which I say more about in section 3 below), I don't think that the methodological naturalist should ultimately focus on either Occam's Razor or IBE. But the key thing to note for now, is that these kinds of extra-empirical principles, are certainly the sorts of principles that could bear on various philosophical debates. Perhaps the collection of data tells us nothing about whether to be a modal realist or not. But if one is supposed to respect simplicity of a certain sort, that might well tell us quite a bit about whether a plurality of worlds is something we should countenance.

Indeed, as we will see in more detail below, if one does adopt methodological naturalism one should expect the implications for

[11] It's also the case that at least some metaphysical debates are sensitive to empirical methodology. (Think, for instance, of the way that data on illusions and hallucinations affects debates about the metaphysics of perceptual states.) But I will set that point aside here. For more, see the discussion on drawing a clean distinction between scientific and metaphysical debates in section 3 below.

[12] For more on underdetermination in general see Stanford (2017). For a more detailed argument for the specifically claim made here see Emery (2023, section 3.1).

[13] An alternative way to think about extra-empirical reasoning is that we use extra-empirical reasoning to set one's prior probabilities before applying Bayesian confirmation theory to select which of the theories compatible with the data is best confirmed by that data.

metaphysical theorizing to be quite impactful indeed. A common way of thinking about contemporary metaphysics is that there is an important distinction between metaphysics of science, and other areas of metaphysics—the former is comprised of metaphysical debates on which our best science potentially has some bearing, while the latter is comprised of metaphysical debate on which our best science is silent. This way of thinking makes a great deal of sense insofar as you are a content naturalist. The content of our best science seems to be clearly relevant to some metaphysical questions, and clearly irrelevant with respect to others. But if you are a methodological naturalist, the aspect of science in which you are interested—the methodology of science, and in particular the extra-empirical aspects of that methodology—is potentially relevant to *any* philosophical debate whatsoever. In this way, methodological naturalism has the potential to make scientific considerations impactful far beyond what seem to be the limits of scientific relevance.

2. From Content Naturalism to Methodological Naturalism

Much more could be said about content naturalism and methodological naturalism as standalone theses, but let's move on now to an important way in which they are related. A key thesis of my recent work,[14] is that there is an important connection between content naturalism and methodological naturalism—a connection captured by the following conditional:

> *The Content Methodology Link.* One should not accept content naturalism unless one also accepts methodological naturalism.

The argument for the content-methodology link can be stated quite succinctly. There is no reason to respect the content of our best scientific theories if we do not also respect the methodology that produces those theories. If one does not think that the methodology that produces scientific theories also tracks good metaphysical theories, then why would one care if one's favored metaphysical theories conflict with our best scientific theories? Those scientific theories were produced by a methodology that, however excellent at producing good science, is not reliable when it comes to metaphysics.[15]

[14] See especially Emery (2023).

[15] See Emery (2023, Chapter 2) for a more detailed presentation and defense of this argument.

The reader will note that this argument does not take a stand on what counts as good metaphysical theorizing. This is by design. According to some philosophers, (I count myself as one of them) the goal of metaphysical theorizing is to come up with theories that are true. Others think some degree of approximation to the truth is the goal, and still others, that the goal is theories that are useful for creatures like us in getting around the world. Some philosophers even think that the goal of metaphysical theorizing is quite radically different—to produce theories that comport with our ethical, social, and political aspirations, for instance, or to produce theories that allow us to practice certain imaginative capabilities, or to develop concepts that can later be deployed in science.[16] The key thing to note is that the argument doesn't depend on endorsing one of these accounts rather than another. Regardless of what you think the goal of metaphysical theorizing is, if you don't think that the methodology that produces out best scientific theories is a good guide to metaphysical theories that achieve those goals, then why would you care if there are conflicts between the content of our best science and our metaphysical theories?

Of course, depending on what you think the goal of metaphysical theorizing is—and in particular if you think that the goal of metaphysical theorizing is very different from the goal of scientific theorizing—you may think methodological naturalism is unwarranted. Suppose, for instance, that you are a relatively straightforward scientific realist—you think that the goal of science is to come up with true theories about what the world is like—but you are also persuaded by McSweeney (2023) that the goal of metaphysical theorizing is to increase our imaginative capacities. Someone with this combination of views will likely think that methodological naturalism is an odd position to adopt. But they should feel similarly about content naturalism. If your aim in metaphysical theorizing is to increase your imaginative capacities, why would you care if your views conflicted with our best scientific theories, which (on this view) aspire to truth?

Something similar can be said for the philosopher who balks at methodological naturalism because they have been convinced that the methodology of science involves appealing to various theoretical virtues that we have no reason to think are truth-tracking.[17] Maybe this philosopher doesn't want these non-obviously truth-tracking virtues to infect her metaphysical theorizing. But note that this philosopher also has no reason to be a content naturalist. Our best scientific theories are, by her

[16] On these alternative approaches to metaphysics see, respectively, Haslanger (2000, 2006) on ameliorative metaphysics, McSweeney (2023) on imaginative capabilities, and French and McKenzie (2012) on the toolbox view.

[17] See Longino (1990).

lights, produced by a methodology that involves non-truth-tracking values. So she should feel free to ignore them.

Similarly, consider someone who thinks, for whatever reason, that the domain of metaphysics and the domain of science are importantly distinct. Perhaps this person is especially moved by the Kantian idea that there is an important difference between the *phenomena* — the world of appearances — and the *noumena* — the world of things in themselves, and associates science with inquiry into the former and metaphysics with inquiry into the latter. To this person, too, methodological naturalism might seem unmotivated. Sure, the methodology of science might be quite good at discerning what we ought to believe about the domain of science, but why think it has any bearing on the domain of metaphysics? But notice that anyone who endorses this reason for skepticism about methodological naturalism should also be just as skeptical about content naturalism. After all someone who thinks that the domains of science and metaphysics are importantly distinct has no reason to be a content naturalist.

The underlying point throughout these examples is that the content-methodology link is a conditional. Therefore objections to the consequent of the conditional that also undermine our reasons for believing the antecedent of the conditional are not genuine objections at all. Many of the concerns that are presented as objections to the link are actually not concerns about the link *per se*, but reasons for responding to the link in one way or another (i.e. accepting both the antecedent and the consequent, or denying both).[18]

Genuine objections to the argument for the link are rare. One of the most common I have heard is the objection that the argument relies on the assumption that there is such a thing as 'standard scientific methodology', when perhaps there is no such thing. Many philosophers of science, in particular, are interested in the ways in which scientific methodology is context dependent, or otherwise non-obvious, and also in the links between scientific methodology and principles of good reasoning more generally. To these philosophers, the phrase 'standard scientific methodology' may seem suspicious.

Ultimately, I do not think that this objection succeeds. Though the reason why not depends on what one means when one complains, "perhaps there is no such thing as standard scientific methodology". On the one hand, if one means that significant aspects of the methodology of science turn out to be context dependent, or to be different from what most of us would otherwise

[18] In principle, of course, one could adopt methodological naturalism while denying content naturalism. I won't say any more about that option here.

assume, or if they aren't actually unique to science at all—well, that is no objection to the argument for the content-methodology link. The link still holds. Insofar as one responds to the link by committing to methodological naturalism then the fact that standard scientific methodology has these features will surely shape how one goes about doing metaphysics. But that is all well and good.[19] On the other hand, if what one means when one says, "perhaps there is no such thing as standard scientific methodology" is that there is literally nothing that answers to the name "scientific methodology"—that nothing at all is held in common across scientific disciplines—well that certainly would in some sense undermine the argument for the link, but it does so in a way that undermines content naturalism as well. For if there is no such thing as scientific methodology, then there is nothing that ties together scientific theories as a unified group. (After all, in terms of their content, scientific theories are highly heterogenous.) And if there is nothing that ties together scientific theories as a unified group then why would one adopt a principle that metaphysicians must, in general, avoid conflicts with scientific theories?

Let's turn now to ways of responding to the content-methodology link.

3. Methodological Naturalism as a Substantive Position

In broad strokes, there are three ways of responding to the content-methodology link. One can decide to reject content naturalism, one can accept methodological naturalism but argue that it has no significant impact on one's metaphysical theorizing because the methodology of science doesn't impact metaphysical debates, or one can accept methodological naturalism and proceed with the expectation that the methodology of science will significantly impact metaphysical debates. I will argue that all three of these options lead to the same result when it comes to our understanding of the scope of naturalistic metaphysics: there is no straightforward distinction between areas of metaphysics where naturalistic considerations are relevant and areas where they are not. Even if one works on the metaphysics of haecceities for instance, or the persistence conditions of works of art, or some other area of metaphysics which is usually assumed to be wholly *a priori*—you need to engage seriously with a difficult set of naturalistic considerations.

[19] Below and also in Emery (2023 Chapter 7) I say more about how the context-dependence of many aspects of scientific methodology might create challenges for the methodological naturalist.

This result is most obvious in the case where one accepts methodological naturalism and proceeds with the expectation that the methodology of science will significantly impact metaphysical debates, so I will begin there.

Suppose one adopts methodological naturalism with the expectation that the view will prove substantive. Given the prevalence of content naturalism, the fact that extra-empirical reasoning plays an important role in scientific practice, and the fact that such reasoning seems to bear on metaphysical debates, this ought to be the default response to the content-methodology link. But what exactly does this view commit us to?

In terms of specific metaphysical positions, an answer to this question goes far beyond the scope of this paper. In terms of a general approach to thinking about metaphysical debates, the answer is quite straightforward. A substantive methodological naturalist should proceed first by investigating the extra-empirical aspects of scientific practice, identifying in particular those aspects that seem widespread and uncontroversial, and then applying those aspects, where relevant, to various metaphysical debates.

Here is an example. I contend that it is a basic principle of scientific practice that well-established patterns in the data cannot be left without an explanation, and in particular that the need to avoid leaving a well-established pattern without an explanation trumps any kind of metaphysical scruple that one might have otherwise used to constrain which theories one adopts.

In prior work I've given a more complete argument for this *pattern explanation principle*.[20] My goal here is just to give a sense of the kind of dialectic that will be relevant. Consider, for instance, Wolfgang Pauli's positing of the neutrino in 1930.[21] In this case, the well-established pattern was an apparent violation of the conservation of energy in beta decay—the total energy of the initial system did not match the total energy of the resulting system. Physicists had considered a range of different explanations for this pattern, but as of 1930, only one of them was still empirically adequate. This explanation, due to Niels Bohr, involved the conservation of energy being occasionally violated. According to Bohr, we should think of this principle in the same way we think about the second law of thermodynamics—it is likely to hold, but not guaranteed to do so.

[20] See Emery (2022a, 2022b, 2023 Chapter 4).

[21] Pauli first put forward this posit in an open letter to the December 1930 group meeting in Tiibingen, reprinted in *Physics Today, 31*(9) (1978). In the letter, Pauli referred to the potential particle as the "neutron", Enrico Fermi later introduced the name "neutrino." See Brown (1978), Pais (1986), and Close (2012) for discussion of this case study.

Pauli, for reasons that aren't entirely clear beyond that he viewed the conservation of energy as being inviolable, thought Bohr's explanation was not a candidate. But he needed some way of explaining the energy loss in beta decay. So he posited the neutrino—a chargeless and massless (or nearly massless) particle that was close to if not entirely undetectable (hence physicists not having detected it so far), and which explained the missing energy. Neutrinos were undeniably weird entities—the sort of thing that physicists, including Pauli, would like to avoid if they could. But Pauli didn't think that they could be avoided, because if they were, the energy loss in beta decay would have no explanation.

Pauli himself called the neutrino a "desperate remedy", and was at first fairly cautious about any commitment to it, but within a few years, further experiments had provided additional data that was incompatible with Bohr's hypothesis. And soon the neutrino was widely accepted among physicists (including Bohr), even though it would not go on to be detected until the mid 1950's. This is, of course, exactly the kind of development that we would expect given the pattern explanation principle that I described above.

Obviously, there is quite a bit of philosophically interesting nuance in this historical episode that I am glossing over. Also, a single episode does not make, on its own, for a very compelling argument. But it is a first step of the sort that the methodological naturalist can and should take. And insofar as the methodological naturalist is indeed able to go farther and show that this is not an isolated case—that there are other instances in which the pattern explanation principle plays a key role in episodes of scientific theory choice, ideally drawing on a range of historical and scientific contexts—that would amount to a compelling argument for the pattern explanation principle as part of standard scientific methodology.

Once the substantive methodological naturalist has identified some principle as a part of standard scientific practice, they can then turn to applying that principle to metaphysical debates. The pattern explanation principle, for instance, has the potential to impact any metaphysical debate where a theory that is more metaphysically suspicious but also more explanatorily powerful is pitted against an alternative that trades that explanatory power for a more austere and less worrisome metaphysics. As an example, think of the debate between Humean and non-Humean accounts of laws. On the former account laws are mere descriptions of the distribution of individual, non-modal events that constitute the so-called 'Humean mosaic'.[22] On the latter account, laws are something over and

[22] See Lewis (1994) and Beebee (2000) for discussion.

above the mosaic. The advantage of the former view is that it keeps one's overall metaphysics simple and straightforward. You don't have to answer any uncomfortable questions about what laws are. The advantage of the latter view is that it is much easier to see how the laws can play the sorts of roles that we usually expect them to play, and in particular, how laws can be the sort of thing that explain why things happen the way they do in the mosaic. Indeed a common objection to Humeanism is that there is no way for the laws to explain their instances.[23]

One way of thinking about the debate between these two views, then, is that they involve tradeoffs. Either you can have a metaphysically minimal theory that leaves the patterns in the mosaic unexplained, or you can have a metaphysically suspicious theory that explains the patterns in the mosaic. You just have to choose what is more important to you, and different philosophers will choose in different ways. That's all there is to it.

However, if the pattern explanation principle is in fact a part of standard scientific practice, then methodological naturalists should not be willing to accept this stand off. The pattern explanation principle shows that it is more important to avoid leaving patterns without an explanation than it is to keep one's metaphysical theory minimal.

Of course, methodological naturalists can still be Humeans—they just need to either argue that the pattern explanation principle is not in fact a part of standard scientific practice, or they need to tell a story on which Humean laws do in fact explain the patterns in the mosaic.[24] In general, this will mean introducing alternative kinds of explanation that allow it to be the case that in some sense the laws depend on the mosaic while also explaining the mosaic. The methodological naturalist will then need to consider whether these alternative kinds of explanation are the sorts of things that discharge the explanatory burden raised by a well-established pattern in the scientific cases that originally demonstrated the role of the pattern explanation principle. I won't try to adjudicate these further moves here.[25] Instead my goal here is to illustrate that how one approaches this very traditional debate in metaphysics ought to change insofar as one is a methodological naturalist, as well as the kind of dialectic that will develop once one takes that approach.

Of course, the pattern explanation principle is at best only one part of extra-empirical scientific methodology. The substantive methodological naturalist very much has her work cut out for her determining the other

[23] See Armstrong (1983) and Maudlin (2007).

[24] The latter strategy is attempted in Loewer (2012).

[25] Though I've written about them elsewhere. See especially Emery (2022a).

parts and how they interact, in addition to their various applications to metaphysics. Indeed one concern that I have often heard voiced in response to methodological naturalism—and in particular the substantive version of methodological naturalism under discussion here—is that it is just too hard. This is an objection that comes most often from those who are well-versed in 20th century philosophy of science. Everyone since at least Kuhn, the objection goes, has been trying to figure out what comprises the extra-empirical aspects of scientific methodology, and there is little consensus. Substantive methodological naturalism, therefore, is just too hard to implement. If one is supposed to determine what the extra-empirical aspects of scientific methodology are before making progress on metaphysical debates one may not make any progress at all.

Ultimately I think the right response to this worry is simply to accept it. We never should have had any expectation that metaphysics would be easy. But for those who are more concerned, let's also consider the various ways in which one might try to avoid this worry by avoiding the consequences of methodological naturalism.

4. Methodological Naturalism without Consequences?

First, let's consider the possibility of accepting methodological naturalism, but arguing that the methodology of science does not have implications for debates within metaphysics. In section 1 we briefly discussed an early version of this view, according to which the methodology of science is exhausted by the collection and analysis of data and metaphysical debates are not impacted by the collection and analysis of data, so methodological naturalism doesn't have any substantive results As I said above, however, it's just incorrect to think that the methodology of science is exhausted by the collection and analysis of data—scientific methodology also involves aspects of extra-empirical reasoning. This was enough to get methodological naturalism off the ground as a plausible position. But are there more nuanced versions of this sort of concern that could still be used to try to motivate the view that ultimately, methodological naturalism even if true, will prove to have no significant consequences?

I will argue that there are not. I'll go through some detailed examples in a moment. But first, a preview of the argument. In short, there is an important difference between saying that the methodology of science has *relatively limited* potential impact on metaphysical debates and saying that it has *no* impact whatsoever. Only a view of the latter sort will allow one to avoid the consequences of methodological naturalism. If you have left open the possibility of the methodology of science impacting metaphysical

debates, and you are a methodological naturalist, then you still need to engage with the same naturalistic considerations that were described above—for each particular metaphysical debate you are interested in, you need to determine which extra-empirical principles plays a role in the methodology of science and whether those principles have any bearing on that debate. You cannot simply assume that just because the content of our best scientific theories does not conflict with any of the candidate positions you are interested in, you are thereby free of naturalistic considerations.

Here is the argument in more detail. There are two broad ways in which we might try to motivate the view that methodological naturalism, though true, has no significant consequences. First, there are views according to which there is some kind of important difference between metaphysical debates from scientific debates, and no reason for thinking that the methodology (specifically the extra-empirical methodology) that works in the latter case also works in the former. Second, there are views according to which any particular instance of scientific methodology is so highly context-dependent that it doesn't have implications even for other nearby scientific debates, much less metaphysical debates.

Consider first those who attempt to argue that there is an important difference between scientific and metaphysical debates and there is no reason for thinking that the extra-empirical methodology deployed in the former has any bearing on the latter. Perhaps the most common suggestion that I encounter along these lines is the suggestion that scientific debates involves cases in which the candidate theories are narrowed extensively using collected data before extra-empirical reasoning is applied. Metaphysical debates, so the suggestion goes, do not involve such "empirical vetting".

The key thing I want the reader to notice is that this empirical vetting distinction is at most a rough rule of thumb. It does not neatly or comprehensively track the standard division of scientific and metaphysical debates. For one thing, the distinction itself is imprecise—what counts as data? Does it need to be hard won in the laboratory or using some complex experimental set-up, or are the way things appear to us part of the overall data set that we have? If the latter, then surely many metaphysical debates are highly empirically vetted—we don't experience the passage of time the way that the Tralfamadorians do in *Slaughterhouse-Five* and that presumably significantly narrows the metaphysical accounts that we can give of the nature of time and the possibility of time travel. Indeed it seems that any way of making the notion of empirical vetting more precise will result in classifying some paradigmatically scientific debates as not-sufficiently empirically vetted (see, for instance, Richard Dawid's (2013)

overview of the state of empirical assessment in contemporary physics as a whole) and some paradigmatically metaphysical debates as in fact sufficiently empirically vetted—consider the way in which different accounts of perception are shaped by the data on illusions and hallucinations, or the way in which different theories in philosophy of language are affected by linguistic data.

The same points can be made for the suggestion that although scientific debates are underdetermined by the empirical data that we collect, they are merely *weakly underdetermined*, i.e. they are underdetermined only relative to the actual data that we have collected thus far. Metaphysical debates, on the other hand, according to this line of thinking, are *strongly underdetermined*, i.e. they are underdetermined relative to any possible data set that we could collect. Again this may be true as a rough rule of thumb, but it does not neatly or comprehensively track the classification between scientific and metaphysical debates. For one thing, the line between weak and strong underdetermination is not as clear as it might first appear. What kind of possibility is relevant to the category of strong underdetermination? Different interpretations of the quantum formalism predict different results in experiments that are relatively easy to describe, but that would take an experimental set-up that is something like 10^8 light years long.[26] Should we consider the debate between these interpretations weakly underdetermined or strongly underdetermined? In any case, it seems that any way of making this distinction precise is likely to result in some paradigmatically scientific debates being classified as strongly underdetermined—consider Belot's (2015) discussion of strong underdetermination in geology—and some metaphysical debates as weakly underdetermined—see again any of the metaphysical debates mentioned above that are in fact sensitive to empirical considerations.

Of course there are other ways of trying to draw a distinction between scientific debates on the one hand and metaphysical debates on the other, but I submit that all of them will end up in a similar position. The distinction will work as a rough rule of thumb, which is well and good for most purposes. But it will not be precise, and on any precisification it will be somewhat revisionary with respect to how we usually classify metaphysical and scientific debates. All of which means that you cannot avoid the consequences of methodological naturalism by adopting one of these views. After all, if your position is that the extra-empirical reasoning that works in scientific debates does not extend to

[26] For example, on such a timescale, spontaneous collapse theories will sometimes predict collapse even though textbook collapse theories do not.

metaphysical debates, and this is why you don't have to engage in the hard work of methodological naturalism—then a rough rule of thumb for distinguishing between scientific and metaphysical debates will not do. When you are faced with a particular metaphysical debate, you need to be open to the possibility that it might be one of the cases that proves to be an exception to the rule.

Let's turn to the second potential justification for thinking methodological naturalism will not have consequences. This justification starts from the thought that methodology in science is so highly context-dependent that one cannot extract any general extra-empirical principles at all—and therefore there is no methodology that even has the potential to impact metaphysical debates. This position is often associated with Elliot Sober's work on simplicity, in which he argues that appeals to simplicity in science are highly context-dependent.[27] It is also a central theme in John Norton's book *Material Induction*, which targets both simplicity (Norton writes, "The apparently singular appeal to simplicity actually masks an appeal to such a diversity of context-dependent facts that no univocal meaning can be attached to it." 2021, pp. 173-174) and inference to the best explanation.[28]

There is much that I agree with in Sober and Norton's work, and the points of disagreement deserve more careful treatment than I can give them here. The main point I want to make here is that there is an important difference between saying that all extra-empirical reasoning in science is highly contextually constrained and saying that *most* of it is. Only the former would fully trivialize methodological naturalism. As I read both of these authors, they do countenance *some* extra-empirical reasoning in science—they just think that it doesn't take the common form that non-scientists (including many philosophers) attribute to it. In particular, it doesn't involve any sort of universal simplicity principle like Occam's Razor or a general principle of explanatory inference like inference to the best xxplanation. But this is not a reason for thinking that methodological naturalism won't be substantive. Indeed it is a reason for thinking that methodological naturalism might turn out to be quite substantive indeed! If extra-empirical reasoning in science doesn't take the straightforward form that many of us assume, then methodological naturalism, once it is paired with a better understanding of the form that reasoning does in fact take, might have results we didn't anticipate at all.

[27] See for instance Sober (1990, 2015).

[28] Norton also cites as important precursors to his work on inference to the best explanation Day and Kincaid (1994) and Khalifa et al. (2017).

Of course, the discussion here has been quite abstract, and to some extent the proof that methodological naturalism will be substantive will come from actually considering particular cases in which extra-empirical methodology in science potentially impacts a metaphysical debate—like the pattern explanation principle discussed above.[29] My point here is just that no one should think that they can avoid the radical changes suggested by the content methodology link and still maintain a straightforward distinction between a priori and naturalistic metaphysical debates simply by adopting methodological naturalism but taking that view to have no significant consequences.

5. Rejecting Content Naturalism

Let's turn now to the possibility of avoiding the consequences of methodological naturalism by rejecting content naturalism. The first key point to appreciate about this option is that unless one rejects content naturalism *wholesale*, one will still end up committed to the consequences of methodological naturalism, as discussed above. The second key point to appreciate is that one should not reject content naturalism *wholesale*. I'll argue for each of these points in turn.

Before doing so, however, let me note that it might seem odd to take the option of rejecting content naturalism seriously, given that the focus of this paper is metaphysics of science. But I think it deserves more scrutiny than one might at first think.

To see why, first consider the point with which I started at the beginning of this paper: we metaphysicians of science have done little to define the boundaries of our own subfield, and in particular what kind of engagement with science is required as a part of that subfield. This isn't necessarily a bad thing—such boundaries, and the time spent policing them, are rarely productive. But it does mean that one ought not simply declare that anyone who rejects content naturalism isn't doing metaphysics of science. My sense is that many philosophers implicitly take content naturalism as a precondition of metaphysics of science, but they also implicitly take content naturalism as a precondition of all metaphysics. What we are explicitly questioning here is precisely whether this precondition makes sense.

Suppose we take, as a minimal definition, the view that the metaphysics of science involves asking metaphysical questions in a way that engages with science. This leaves open a number of options for how we

[29] See Emery (2017, 2019, 2022a 2022b, 2023, Chapters 4-6).

think of our work as metaphysicians and its interaction with science—not all of which require anything like a commitment to content naturalism. One could think that all science requires metaphysical presuppositions and the role of the metaphysician of science is to identify, elucidate, and provide an independent justification for these presuppositions. Surely this view is in principle just as deserving of the name 'metaphysics of science'. Or perhaps one is only willing to accept some of the content of our best scientific theories as literally true and one's work as a metaphysician involves spelling out the metaphysical commitments of our best scientific theories in light of this restriction. This, too, seems to me to be a straightforward variety of metaphysics of science, even if it involves giving up content naturalism.

Interestingly, both of the views just described—that scientific theories involve metaphysical presuppositions and that only some of the content of our best scientific theories should be taken to be literally true—are views that are often endorsed by philosophers of science. Consider, for instance, those philosophers who endorse structural realism because they think it is the best response to the pessimistic meta-induction.[30] They should by no means be thought of as non-naturalistic, even if they don't accept content naturalism.

Limited versions of content naturalism

Content naturalism as formulated here is quite a strong thesis. As I argued above, it seems to enjoy widespread acceptance among contemporary philosophers. But there are reasons—including reasons stemming from philosophy of science—to be suspicious of it.

Consider, for instance, someone who argues that content naturalism as stated above is too strong because they are worried about the term 'our best science'. One might think the only clear definition of 'our best science' is the scientific theories that are written down in various textbooks and taught in various science classes. And those theories, we all know, are sometimes fallible—if nothing else, every now and then they get updated. So even if we have very good reason to trust our best scientific theories in general, we should at least be open to the idea that they could be wrong.

[30] Structural realism is a version of scientific realism that says only the mathematical or structural content of our best scientific theories should be taken as true. Many philosophers of science adopt this view as a response to the pessimistic meta-induction, which argues that we cannot be straightforward scientific realists in light of the fact that all of our previous scientific theories have eventually turned out to be false.

Someone who takes this view would naturally adopt the following, weakened version of content naturalism:

> *Defeasible content naturalism.* Metaphysicians have very good though defeasible reason not to accept theories that conflict with the content of our best scientific theories.

I want to emphasize that adopting defeasible content naturalism would be a significant departure from the way that metaphysical practice currently plays out. In the debates described when I first introduced content naturalism, the interlocutors don't think we have very good though defeasible reason to be worried if there is in fact a conflict between a particular metaphysical view and our best science—even those who are strongly committed to maintaining the metaphysical view in question are willing to go to quite great lengths to try to show that any apparent conflict is merely apparent, instead of accepting it and moving on.

That said, it is also important to recognize that even if you're only committed to defeasible content naturalism, a version of the content-methodology link will still apply. After all, if you have very good though defeasible reason not to put forward theories that conflict with our best scientific theories then you have very good though defeasible reason to think that the methodology that produces our best science is a good guide to metaphysical theorizing. In other words if you are defeasible content naturalist you should also be a defeasible methodological naturalist.

> *Defeasible methodological naturalism.* Metaphysicians have very good though defeasible reason to, whenever possible, use the same methodology that scientists use.

In other words, the very same argument as given for the original content-methodology link above also supports, *mutatis mutandis*, the defeasible content-defeasible methodology link:

> *The defeasible content-defeasible methodology link.* You shouldn't be a defeasible content naturalist unless you are also a defeasible methodological naturalist.

And defeasible methodological naturalism has many of the same consequences as full-fledged methodological naturalism, especially with respect to how we think about the obligations that metaphysicians have to engage with scientific considerations, regardless of the particular topic

of their investigation. If you are committed to defeasible methodological naturalism of either a nominal or a substantive variety, then you need to engage in serious scientific considerations regardless of what type of metaphysical question you are addressing.

And the same argument will go for other ways of rejecting content naturalism that still leave one committed to a weaker version of the view. For instance, suppose the pessimistic meta induction has convinced you to be a structural realist. In that case you won't be committed to full-fledged content naturalism as discussed above, but you'll still be committed to a limited version of the view.

> *Structural content naturalism.* Metaphysicians should not put forward theories that conflict with the structural content of our best scientific theories.

And, for the same reasons given above, I will argue that if you are a structural content naturalist then you should also be a structural methodological naturalist.

> *Structural methodological naturalism.* Metaphysicians should, whenever possible, use the same methodology that scientists use to produce the structural content of our best scientific theories.[31]

Even if you think we merely have *pro tanto* reason not to put forward theories that conflict with our best science, you should still accept:

> *Pro tanto content naturalism.* Metaphysicians have pro tanto reason not to accept theories that conflict with the content of our best scientific theories.

And, for the same reasons given above, I will argue that if you are pro tanto content naturalist you should also be a pro tanto methodological naturalist.

> *Pro tanto methodological naturalism.* Metaphysicians have pro tanto reason to, whenever possible, use the same methodology that scientists use.

[31] There may be lingering concerns here about whether the methodology that produces the structural content is separable from the rest of scientific methodology. I say more about this, and some ways of responding, in Emery (2023 chapter 2).

And that pro tanto methodological naturalism has many of the same consequences as full-fledged methodological naturalism.

What all this shows is that one cannot easily avoid the consequences of methodological naturalism by rejecting content naturalism. Of course, strictly speaking, all one needs to do to reject content naturalism is to say that there are at least some cases in which metaphysicians are permitted to put forward theories that conflict with our best scientific theories. But given the link described in this section between content naturalism and methodological naturalism, the only way to avoid the consequences of methodological naturalism is to reject content naturalism wholesale. If you still accept a somewhat weakened or limited form of content naturalism, many of the same consequences will still follow from the corresponding weakened or limited form of methodological naturalism to which you are also still committed.

Unmoored metaphysics

The second key point I wish to make in this section is that we should not reject content naturalism wholesale. To reject content naturalism wholesale is to think that one should be entirely happy to accept metaphysical theories that conflict with the content of our best science theories. In other work I have called this approach to metaphysics *unmoored metaphysics* because it is a view on which metaphysics floats free from science.

There are some possible motivations for rejecting content naturalism wholesale which are fairly obvious—but also, I think, fairly obviously misguided. Suppose, for instance, that you simply think that metaphysics is a better guide to the truth about what the world is like than science. While this position would support *unmoored metaphysics*, it is a position for which there is little, if any, support. Given the enormous and progressively more refined success of science in predicting and explaining facts about what the world is like, and given the lack of anything like straightforward progress in metaphysics, one simply should not think that metaphysics is in better epistemic standing.

Other possible motivations for unmoored metaphysics are more subtle and, I think, more persuasive. Among these I include the views mentioned in section 1 according to which there are alternative reasons for doing metaphysics other than answering questions about what the world is like. These include McSweeney's (2023) view that the goal of metaphysics is to increase imaginative capacities or the French and McKenzie (2012) view that the goal of metaphysics is to stock a conceptual

toolbox that can later be deployed by scientists as needed. Either of these views might motivate one to think that unmoored metaphysics is in good standing.

My key concern about these views is that if they are taken to be a complete story about the purpose of metaphysics, then they drastically constrain human inquiry into what the world is like. There are questions about what the world is like that are, for whatever reason, not tackled by scientists. If metaphysicians do not tackle these questions, who will?

6. Conclusion

The goal of this paper has been to show how careful thinking about the relationship between metaphysics and science can and should reshape both how we approach the kinds of questions that metaphysicians of science are interested in and how we think about the domain of metaphysics of science in general. The relationship between content naturalism and methodological naturalism, and the broad potential applicability of the latter view, should make us suspicious of any supposed limits on metaphysics of science or any significant distinction between naturalistic metaphysics and a priori metaphysics. Even when it comes to the debates that have been traditionally assumed wholly a priori, philosophers must engage with serious scientific considerations in order to be in good standing. Of course I haven't said much at all here about the particular theories that we will ultimately endorse once we recognize the consequences set out in this paper. That is work that is ongoing and in which I hope other metaphysicians of science will join me.[32]

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[32] Thanks to audiences at UC Louvain, Rutgers University, and the University of Athens. Thanks also to the Society for the Metaphysics of Science, to whom I presented this paper as the presidential address in 2023.

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