Neo-positivist metaphysics

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Abstract   Some philosophers argue that many contemporary debates in metaphysics are "illegitimate," "shallow," or "trivial," and that "contemporary analytic metaphysics, a professional activity engaged in by some extremely intelligent and morally serious people, fails to qualify as part of the enlightened pursuit of objective truth, and should be discontinued" (Ladyman and Ross, *Every thing must go: Metaphysics naturalized*, 2007). Many of these critics are explicit about their sympathies with Rudolf Carnap and his circle, calling themselves 'neo-positivists' or 'neo-Carnapians.' Yet despite the fact that one of the main conclusions of logical positivism was that metaphysical statements are meaningless, many of these neo-positivists are themselves engaged in metaphysical projects. This paper aims to clarify how we may see a neo-positivist metaphysics as proceeding in good faith, one that starts with serious engagement with the findings of science, particularly fundamental physics, but also has room for traditional, armchair methods.

Keywords   Metametaphysics · Metaphysics · Neopositivism · Indispensability arguments

1 Introduction

Logical positivism never fully faded from the mainstream in philosophy. Despite the renaissance in metaphysics, there remains a significant group of philosophers that are critical of many of the metaphysical debates that are carried out today. Metaphysical debates are accused of being "illegitimate," "shallow," or "trivial." Some have argued that in metaphysics, "a distressing amount of philosophical

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energy [is] invested in questionable projects," and that "contemporary analytic metaphysics, a professional activity engaged in by some extremely intelligent and morally serious people, fails to qualify as part of the enlightened pursuit of objective truth, and should be discontinued." What we find is a "reversion to a seventeenth-century style of metaphysics" that is "disastrous."[1] Some of these critics are explicit about their sympathies with Rudolf Carnap and his circle and call themselves 'neo-positivists' or 'neo-Carnapians.' Yet somehow, despite the fact that one of the main conclusions of logical positivism was that "in the domain of *metaphysics*,… logical analysis yields the negative result *that the alleged statements in this domain are entirely meaningless*" (Carnap 1932, pp. 60–61), many of these contemporary neo-positivists are themselves engaged in metaphysical projects, respecting perhaps the spirit, but certainly not the letter of logical positivism. This raises the question of what distinguishes the neo-positivist metaphysical projects from their allegedly problematic rivals.

One obvious feature characterizing many neo-positivist metaphysical projects is their serious engagement with the findings of science, particularly fundamental physics.[2] As Carnap and the Vienna Circle took the claims of physicists, unlike those of metaphysicians, to be in good epistemological standing (if in need of clarification), neo-positivist metaphysicians seek only to make metaphysical claims that can inherit such justification. What I aim to do here is clarify one way in which we may see a neo-positivist metaphysics as proceeding in good faith. This is intended partly as an antidote to some of the more draconian proposals for what a metaphysics must be if it is to escape the charges of the positivists such as that found in Ladyman and Ross's (2007) book *Every Thing Must Go*. My proposal owes much to the meta-ontology of Quine and unlike that of Ladyman and Ross, it does have a limited role for the use of armchair or rationalist methods in metaphysics. There are many metaphysicians working in this mold who would not, or at least have not, come out and explicitly characterized themselves as neo-positivists, and in a sense it is silly to, since the designation seems so clearly to be an oxymoron. Nevertheless, I don't mean to use this label ironically. I retain it to highlight the fact that the proposed methodology for metaphysics, one I find attractive, is one that aims to be sensitive to a distinction between those metaphysical claims that can be justified and those that cannot, a distinction that finds its inspiration in the work of Carnap and the logical positivists.

I will add that my proposal can also be viewed as useful from another angle: as an attempt to fill in with more precision the methodological stance of the physicalist. Physicalists believe that one should believe in all and only those entities posited by physics (or those that are constituted or realized by those entities posited by physics). However, there is a live issue about how one who accepts this norm ought to actually go about populating her ontology. The ontological commitments a physicalist should

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[1] Quotes above are from Chalmers et al. (2009), Ladyman and Ross (2007), Maudlin (2007), and Van Fraassen (2002).

[2] I am going to be singling out and attempting to characterize one particular version of neo-positivist metaphysics in this essay. Chalmers (2009) and Hirsch (2009) are other metaphysicians who voluntarily take on the 'Carnapian' label. These views seem to me to be aimed at bringing into the twenty-first century a different form of positivism than that with which I am concerned here.

not have are clear. Physicalists shouldn't believe in nonphysical entelechies, Cartesian souls, or irreducible phenomenal properties. But it is not similarly clear how a physicalist is supposed to go about forming her positive metaphysical commitments. Should she just turn to the nearest physics textbook and believe everything it says? What if, for example, different physics textbooks offer rival characterizations of physical theory? The proposal below will provide an answer to these and related questions.

2 Carnap's critique of metaphysics

Let's start by refamiliarizing ourselves with Carnap's critique of metaphysics so we can see the motivation for the methodology for metaphysics I propose below. In his "Elimination of Metaphysics Through the Logical Analysis of Language" (1932), Carnap argued that metaphysicians distort language in various ways to produce statements that in the end prove meaningless. As a result, all distinctly metaphysical claims for Carnap are meaningless. Sometimes this comes about because the metaphysician is introducing new words without ever supplying clear meanings for them, for example, 'Essence,' 'emanation,' and 'the Ego'. Sometimes metaphysical claims turn out to be meaningless because the metaphysician uses words that normally have a clear meaning in an unorthodox and unclear way ('principle of the world,' 'God'). Other times, the problem is one of syntax, where expressions are combined by metaphysicians so as to form sentences that cannot be evaluated for truth or falsity. Here, Heidegger's *Das Nichts selbst nichtet* is taken in for an extended bashing. When Carnap claims that words are being used so that the sentences they compose lack meaning, he is very explicit about the theory of meaning he intends. To illustrate this theory of meaning, Carnap says that for a given sentence S, all of the following are reformulations of the same question:

(1)   What sentences is S *deducible* from, and what sentences are deducible from S?
(2)   Under what conditions is S supposed to be true, and under what conditions false?
(3)   How is S to be *verified*?
(4)   What is the *meaning* of S? (1932, p. 62)

Due to the stated equivalence of questions (3) and (4), Carnap is endorsing a verificationist theory of meaning. (It will also be useful to keep in mind for what follows the proposed equivalence of questions (1) and (4).) As is widely known, the logical positivists only recognized two forms of verification that a statement might have: verification through analytic methods (i.e. logic) and through empirical methods. The trouble with metaphysicians' use of language whether through distortions of normal syntax or semantics, what makes such statements ultimately meaningless, is that such distortion yields sentences incapable of verification in either of these senses.

   In "Empiricism, Semantics, and Ontology" (1950), Carnap addresses metaphysical statements that wouldn't obviously fall prey to the earlier critique: ontological statements like 'There are material objects,' or 'There are numbers.' The trouble

with these statements is that even if they can be evaluated as true in a system with clear syntactic and semantic rules (that is, evaluated *internally* in Carnap's 1950 terminology), they are hopelessly trivial and as such, cannot be attributed the significance the metaphysician intends for them. Some have interpreted Carnap's claim that such statements would be trivial as saying they turn out analytic in any linguistic system. However, there are a couple of reasons not to prefer this interpretation. First, there are many mathematical statements (e.g. 'There are prime numbers greater than one million') that Carnap regards as analytic but not trivial. Moreover, some ontological claims may be trivial and yet nonetheless earn empirical verification.[3] For both of these reasons it makes more sense to understand Carnap as arguing that ontological statements when evaluated internally are all trivial for a distinct reason. It is not because they are always analytic but instead because relative to a system in which terms like 'material object,' 'number,' and so on appear, statements like 'There are material objects' or 'There are numbers' will follow from too many other statements in the language to have a significant meaning.[4] For example, once one adopts a language with terms like 'chair,' 'table,' and 'material object,' there will be an enormous number of statements containing such terms that get verified through empirical means. For example, if we are standing in Dodger Stadium, each of the following sentences receives empirical verification: 'There is one chair,' 'There are two chairs,' 'There are three chairs,' and so on. Each of these sentences will entail that the ontological claim 'There are material objects' is also true in the language. Now let's return to the proposed equivalence between questions (1) and (4) above. If the question, 'What is the meaning of S?' is equivalent to 'What sentences is S deducible from?' then since ontological statements are (if true) derivable from so many statements in a language, they are trivial when considered internally.

So, ontological statements turn out to be trivial when considered internal to a linguistic system. This isn't to say that there is no way to make sense of them so that they are not trivial. For Carnap, there is a good question one can ask using claims such as 'Are there numbers?' or 'Are there material objects?', namely whether or not it would be wise to adopt a linguistic system in which such claims come out as true. This is an example of what Carnap calls an external question, a question that is asked not from within the linguistic system in question, but from the outside as it were, a question that is about the linguistic system in question as a whole. Such questions cannot be evaluated as true or false (nor do they earn objective justification: verification) since such verdicts can only be reached from within a linguistic system, presupposing the system's syntactic and semantic rules (the latter of which state the analytic or empirical means by which one could verify the statement in question). As such, external questions are pseudo-questions. Nonetheless, there is a way to understand them, namely as asking whether one should adopt a certain sort of linguistic system. Carnap summarizes his attitude towards ontological statements ultimately in the following way:

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[3] See the discussion of 'There are material objects' below.

[4] Assuming, that is, that such claims are true at all in that system.

> An alleged statement of the reality of [a] system of entities is a pseudo-statement without cognitive content. To be sure, we have to face at this point an important question, but it is a practical, not a theoretical question; it is a question of whether or not to accept the new linguistic forms. The acceptance cannot be judged as being either true or false because it is not an assertion. It can only be judged as being more or less expedient, fruitful, conducive to the aim for which the language is intended. (1950, p. 214)

This isn't too distant a verdict from that reached in the 1932 paper in which Carnap was addressing the status of a larger class of metaphysical claims, not merely ontological ones:

> The (pseudo)statements of metaphysics do not serve for the *description of states of affairs*, neither existing ones … nor non-existing ones… They serve for the *expression of the general attitude of a person towards life*… What is here essential for our considerations is only the fact that art is an adequate, metaphysics an inadequate means for the expression of the basic attitude. Of course, there need be no intrinsic objection to one's using any means of expression one likes. But in the case of metaphysics we find this situation: through the form of its works it pretends to be something that it is not. The form in question is that of a system of statements which are apparently related as premises and conclusions, that is, the form of a theory. In this way the fiction of theoretical content is generated, whereas, as we have seen, there is no such content. (1932, pp. 78–79)

A perhaps significant difference is that whereas earlier Carnap took metaphysicians to be doing nothing more imbued with significance than whatever one finds in music or art, in the later work, he at least acknowledges that ontological questions like 'Are there numbers' may be construed in such a way as to "face an important question." Still, it is arguable that Carnap continued to view the choice of a given linguistic framework as purely a matter of "the general attitude of a person."

3 From Carnap to Quine

A common folklore about twentieth century philosophy is that after Carnap and his colleagues presented such arguments, contemporary philosophers nearly unanimously rejected metaphysics as a viable research program in philosophy. Analytic philosophy proceeded metaphysics-free for several years until Quine came along and showed that the positivists' project rested on untenable commitments (to the analytic/synthetic distinction and reductionism to a phenomenalist basis). Everyone agreed with Quine and metaphysics re-emerged as a popular subfield of analytic philosophy (Putnam 1997). Many recent articles have argued that this folklore is a myth (Price 2009; Soames 2009; Wilson 2011). I agree with this latter verdict. What Quine did, among other things, was to label the practical project Carnap discussed of choosing a linguistic framework deciding an 'ontology' and argue that such projects had no lower epistemic standing than the projects with which scientists

concern themselves. Quine argued for the equal footing of ontology and science by attacking the analytic/synthetic distinction (Quine 1951). But he did this with the intended end result not of promoting ontological claims from the status Carnap assigned them, but instead by demoting scientific claims. Since no claims, not even the claims of scientists, are ever really verified purely by analytic or empirical means, every statement is ultimately to be evaluated using practical considerations. Science and what Quine calls deciding an 'ontology' are equally viable projects. Carnap objected to this relabeling of a linguistic choice as 'acceptance of an ontology' apparently because it endowed a nonmetaphysical practice with a "misleadingly" metaphysical-sounding label (1950, Footnote 5). But as far as the nature of the project of ontology itself was concerned, Quine and Carnap were in large agreement: it was an important project, but one that was ultimately decided by pragmatic means.

In the end, the significant difference between Carnap and Quine's attitudes towards ontological issues appears to be not much more than which frameworks are in fact promising for particular purposes. On this topic, we find Quine endorsing the view that a physicalist framework deserves favor for projects in fundamental ontology, even if a phenomenalist ontology might be preferred for other, epistemological purposes (1948, p. 18). By this period, although Carnap notes that there is agreement between himself and Quine that in choosing a linguistic framework, "the obvious counsel is tolerance and an experimental spirit" (Quine 1948, p. 19 quoted in Carnap 1950, Footnote 5), Quine (1951) suggests that physicalist frameworks are preferable to phenomenalist ones when the project is to "limn the deep structure of reality" (Quine 1960, p. 281). Carnap appears to have thought that the phenomenalist and physicalist ontologies/frameworks were on equal footing for the remainder of his career (see the discussion in his 1963 autobiography).

So, where does this leave us as post-positivist metaphysicians noting that nothing Quine said undermined the crux of Carnap's anti-metaphysical critiques? As metaphysicians, don't we seek objective truth? But how can we achieve this goal if there will always be rival frameworks offering competing accounts of the truth and no objective way to choose between them? If we agree with Carnap, we must deny we possess any way to verify which ontology is correct. As Quine says, we can weigh various ontologies by their various theoretical virtues:

> Our acceptance of an ontology is, I think, similar in principle to our acceptance of a scientific theory, say a system of physics: we adopt, at least insofar as we are reasonable, the simplest conceptual scheme into which the disordered fragments of raw experience can be fitted and arranged. (1948, p. 16)

But as Quine himself notes in the next words in this passage, there will always be distinct ontologies that result from this weighing process. Even if we agree we seek simplicity in our system, simplicity is itself an ambiguous concept. An alternative methodology is to just select an ontology at will and read off the details, though then any results would appear to be arbitrary and (as Carnap emphasized) trivial.

One alternative that is not discussed by Carnap in "Empiricism, Semantics, and Ontology" is the following, to select whatever linguistic state fundamental physics is in when we find it and take that to determine our ontology. This seems less arbitrary than just selecting a system at random. And, this would appear to be how many if not most analytic philosophers proceed today, even if they do not explicitly acknowledge this methodological choice as a response to the preceding problem. After all, most analytic philosophers today are physicalists and this is how physicalism is often characterized. Barry Loewer characterizes physicalism as the claim that "all facts obtain *in virtue of* the distribution of the fundamental entities and properties—whatever they turn out to be—of completed *fundamental physics*" (2001, p. 37). And Andrew Melnyk's realizer physicalism is "the universal generalization that everything—every *thing*—is either mentioned as such in fundamental physics or else is realized by things that are" (2003, p. 9). This strategy of getting out of the positivist dilemma wouldn't necessarily have the choice of ontology be subjective or arbitrary because those physical theories that physicalists use to inform their metaphysics have already met high standards for justification and acceptance. Melnyk, for example, explicitly targets only those theories on which the physics community has reached consensus as revealed in the contents of college and graduate-level textbooks (2003, p. 15). So why didn't Carnap consider this option and thereby make the choice between frameworks rational, as opposed to merely pragmatic?

To answer this question, we may start by noting that Carnap's stated motivation for moving from the study of physics to philosophy in the first place was his disappointment with the fact that scientists when they are formulating their theories, including fundamental physics, are not precise in expressing their theories in such a way that it is clear enough what the theories' entailments are. To find a way to precisely state one's physical theories is a project in the "logic of science" (see Carnap 1963, pp. 11–13, Carnap 1984, p. 6), and Carnap's interest in this project was inspired by developments in logic of Frege, Russell, and Whitehead. Part of Carnap's point in "Empiricism, Semantics, and Ontology" was that there were multiple ways to accomplish this task for physics and so there is no simply reading an ontology off physics as contemporary statements of physicalism would suggest.[5] When Carnap discusses the view he calls 'physicalism', he usually intends to contrast it with phenomenalism, where here he has in mind the view that we should formulate science not in physical language but instead in a phenomenal language. Ultimately, Carnap came to recognize that physicalism and phenomenalism were both promising views about what should be the language of unified science. Although he started out preferring phenomenalism (as a view about language), he eventually came to be more and more sympathetic to Otto Neurath's position that

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[5] As an historical claim about Carnap's views, this statement is somewhat confusing since 'physicalism' today is used differently than Carnap used it. Carnap himself was aware of the ambiguity in the term. It will help to note the following. When Carnap says 'physicalism,' he usually has in mind not a metaphysical claim but the view that unified science should be formulated in one particular language: physical language. And when he says 'physical language,' he does not mean simply whatever language is used in physics. Rather, he means a language that uses terms for objects in space and time (Carnap 1934, p. 54). More on this distinction in a moment.

physicalism had its virtues (Carnap 1934, 1963, pp. 50–51). So, Carnap thought it was possible to regiment physics by formulating it in a plurality of forms.[6] Even if we always start from what is known on the basis of our best, most fundamental science, this won't help us avoid arbitrariness in settling on an ontology.

This is a point conceded too by Quine, and further revealed by his discussion of paraphrase. Quine thought that when one is formulating a scientific theory in the most clear, precise language, we have some choice in how to do so. His famous example concerns a scientific theory appearing to make reference to abstract entities like species:

> …when we say that some zoological species are cross-fertile we are committing ourselves to recognizing as entities the several species themselves, abstract though they are. We remain so committed at least until we devise some way of so paraphrasing the statement as to show that the seeming reference to species … was an avoidable manner of speaking. (1948, p. 13)

There may be different ways of formulating the same scientific theory and different formulations will carry with them different ontological entailments. How is one to decide between them? Just saying we should start from physical theory (because it is the most justified) does not get us all of the way to an answer, since this may result in a variety of competitor theoretical frameworks, and hence a variety of competitor metaphysics. For Quine and Carnap, as we know, this is merely a practical choice one has to make, based perhaps on "a general attitude one has to life".

4 A proposed methodology

Perhaps. However, perhaps it is possible to reach some objective, non-arbitrary truths in metaphysics. The following strategy suggests itself. Perhaps there is no objective, not-merely-pragmatic way to choose between rival formulations of physics that meet acceptable criteria of theory choice. Perhaps we can and physicists do, as Carnap and Quine thought, formulate our best fundamental scientific theories in different ways that support different interpretations. Even if we agree we should start with fundamental physical theories, because those are (a) the theories that aim to give a complete account of our world, and (b) those that deliver the best justified theoretical frameworks, there is no genuine question about which overall ontology is correct. Still, there may be certain elements of these rival ontologies that are repeated. Perhaps certain representational elements are found in *every* formulation of fundamental physics that meet criteria of theory choice accepted by the physics community. There might be some representational features that are as a matter of fact indispensable to our best physical theories as they are actually understood. If one could show that, to state our fundamental physics clearly, precisely, and accurately, one must use certain kinds of representing devices, then perhaps this

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[6] Following the comments in the preceding footnote, Carnap would want to say that physicalism (in the contemporary sense) is compatible with both physicalism (in Carnap's sense of the word) and phenomenalism. The latter two positions are alternatives about how to formulate the claims of physics.

would show something that had genuine significance and justification, something that went beyond merely expressing one's preferences for a particular kind of conceptual scheme or linguistic framework.

What I am suggesting is that the sort of indispensability arguments associated with Quine (1948/1953, 1981) and Putnam (1975) in the philosophy of mathematics ought to be the starting point of a neo-positivist metaphysics. Following Mark Colyvan, I take the standard Quine–Putnam indispensability argument to take the following form:

> (P1) We ought to have ontological commitment to all and only the entities that are indispensable to our best scientific theories.
> (P2) Entities of kind X are indispensable to our best scientific theories.
> Therefore,
> (C) We ought to have ontological commitment to entities of kind X. (Colyvan 2008)

Stated this way, indispensability arguments concern whether or not we should adopt a certain class of entities into our ontology (those that are referred to by noun terms including variables). I propose we extend this more generally to representational devices in science. We may thus generalize the argument using the following schema, as there is no prima facie reason why there aren't other metaphysical issues, beyond ontological issues, that may be decided by an appeal to indispensability in fundamental physics:

> (P1) We ought to have metaphysical commitment to all and only the entities, structures, or principles that are indispensable to our best scientific theories.[7]
> (P2) X is indispensable to our best scientific theories.
> Therefore,
> (C) We ought to have metaphysical commitment to X.

All rival formulations of our physical theories may invoke a commitment to numbers, sets, or other mathematical objects as defenders of the original indispensability arguments believed. But they may also license a commitment to other kinds of entities like events or laws of nature. They may invoke a commitment to kinds of structures, like spatiotemporal, state space, or modal structures. Or they may be such as to license a commitment to certain kinds of principles, such as determinism or locality principles. Those entities, structures, and principles in which we come to believe as a result of what is found to be indispensable to the formulation of our physical theories will form what we may call our *core metaphysics*.[8] This is a metaphysics that should meet the positivist's standards for

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[7] This is probably as good a place as any to make a note about something I have ignored in the main body of the text. This is that the method for neo-positivist metaphysics I am proposing really only explicitly concerns how one should settle one's fundamental metaphysical commitments, and this is why the science that this method takes to inform metaphysics is fundamental physics. This leaves open the question of whether or how one should choose a derivative, i.e. non-fundamental metaphysics. I try to address this issue elsewhere in my work on reduction.

[8] Allan Hazlett has suggested I call this method of coming to believe (in) only what is common to all formulations of our current physical theories the *Intersection Method*.

comprehension and justification for the following reasons. Forming one's metaphysics in this way does not involve answering any Carnapian external questions, choosing between systems using standards arrived at independently of the internal semantic and justificatory standards within physics.[9] Using this method, all ontological claims will be given sense and justification using the standards of our best science. Nor are the ontological results achieved trivial or arbitrary, since we have not merely selected one system and read our results off. We have only followed what is common to all systems.

I should be explicit that I am not expressing commitment to either the verificationist theory of meaning, the verificationist theory of justification, or to the analytic/synthetic distinction it is often thought the latter view assumes. The neo-positivist may be attracted to something like a verificationist epistemology and a skepticism about metaphysical knowledge that floats free of what we may learn through logic or science. But the relevant semantic and epistemological claims I mean to endorse here are only the following. First, the claims of our best, fundamental physical theories are meaningful. Second, the claims of our best, fundamental physical theories are justified. How they come to be justified, how they come to be accepted in the first place: these are issues that this account of methodology in metaphysics need not take a stance on. The point is that physics has a proven track record of success making it a good place to begin metaphysical inquiry.

This is satisfying, to find a metaphysics that meets the positivist challenge, but the proposal itself raises several questions. The first and perhaps most immediate is what makes an element of physical theory indispensable. The intuitive idea is meant to be that the physical theory would not be the same, make the same predictions, give the same explanations, and so on, if it lacked these components. But how does one decide which elements meet these criteria? I would argue that the sort of indispensability that is relevant here is what is indispensable to physical theory according to the physics community. This is not something to be determined by us as philosophers. We might look at current physics from the outside and say that its explanations would be incomplete if it did not appeal to this or that of our preferred metaphysical elements: say a first cause, or a domain of concrete, persisting objects with intrinsic properties, but if the physics community does not build such things into its theories and thinks that its explanations are satisfactory as they stand, then we must conclude that such things are not indispensable to current physical theory. And, by the same token, we should not as philosophers looking at physics from the outside, conclude that some of the entities, structures, or principles in our best physical theories can be removed from the theory without detriment to the theory's ability to predict and explain. We may if we like certainly work on our own to construct alternative versions of our best physical theories that lack certain elements and offer them to the physics community as an alternative formulation of theory X or theory Y. However, it is then their choice whether to endorse this as an

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9 Note that this does involve in one sense at least siding with Carnap against Quine. Quine, recall, argued that we don't even have objective, not-merely-pragmatic standards of verification within science. So, Quine was a pragmatist about all matters, not just metaphysical matters. The present view depends on rejecting such a global pragmatism. Science can provide us with objective justification for its claims.

acceptable alternative formulation or not.[10] Until they do, it is not an alternative formulation of physical theory that has met the standards of acceptance and confirmation of science and so cannot have a bearing on which elements of physical theory are or are not dispensable. As a consequence, the number of alternative formulations of physical theories will be somewhat limited, limited by the alternatives that have been considered, vetted, and endorsed as acceptable alternative formulations by the physics community as a whole.

It is my view that there are actually not so many different ways of formulating physics as Carnap suggested.[11] In particular, one doesn't find either phenomenalist or physicalist (in Carnap's sense of physical-object language) formulations of fundamental physical theory. Fundamental physics tends to be formulated today in much more abstract mathematical terms than was the case in the early twentieth century. And rival formulations share much of this common mathematical language. As a result, this makes it much more likely there will be features common to all acceptable rival formulations.[12]

One thing the methodology I have so far been proposing assumes is that physics does as a community issue verdicts bearing on what is and what is not indispensable to a particular theory. Some may criticize this assumption, but I do not think that this is overly optimistic. For example, physicists do tend to assume that a theory is only relativistic if it involves laws that operate in the same way in all inertial reference frames. Lorentz invariance does thus appear indispensable to any theory physicists will count as relativistic. Similarly, any theory that is genuinely called a version of quantum mechanics must, say, support the Born rule, require a discrete set of (mutually orthogonal) energy states, and so on. These are thus indispensable elements of quantum mechanics. Determinism (or indeterminism) is not. Physicists take seriously both deterministic formulations of quantum mechanics (e.g. Everettian versions) as well as indeterministic formulations (versions positing an objective collapse of the wave function).

So far, I've tried to say more about what should guide the search for indispensable elements in physical theories. I've given my own proposal for what should determine which elements are and are not indispensable. This proposal puts a lot of weight on what actual formulations of physical theory exist and have risen to an adequate level of acceptance, as well as what physicists count as alternative formulations of the same physical theory. An alternative approach would privilege a different, less contingent notion of what is indispensable. One could (a) allow for more alternative formulations of physical theory beyond those which have actually been developed, (b) allow for more alternative formulations than those physicists have actually endorsed as a community, (c) rest the decision for what does and does not count as alternative formulations of the same physical theory elsewhere than on the physics community, or all of the above. For the purposes of this paper, I do not

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[10] This is another place where I am not sure I agree with Quine, and what Field (1980) takes to be the metaphysical upshot of his reformulation of physics in *Science Without Numbers*.

[11] Thanks to an anonymous referee for this journal for raising this issue.

[12] This is not to say that the debate between phenomenalism and physicalism (in today's sense) does not come up at all. My view is that this comes up at a later stage as will (I hope) become clear in the next section.

want to be too insistent on which is the right way to go about this. I have adopted the more restrictive approach outlined above because the goal is to get out a metaphysics that has established its semantic and justificatory credentials via physical theory itself, without having to also develop a semantic theory and epistemology for physics. The more we depart from actual physical theories that are accepted by the physics community and conceptions of what is and is not essential to actual physical theories according to the physics community, the more we stray from this goal. But perhaps we can be more liberal than I've been.[13]

Another question we should consider is whether it is always a good idea to draw metaphysical conclusions from what is indispensable to our current, fundamental physical theories. This is certainly what the argument schema I proposed above would suggest, but isn't it the case that physicists often introduce representational elements into their theories without intending anyone to draw metaphysical conclusions from their use? Indeed, and this is to raise a related point, many physicists, if asked, think we shouldn't draw any metaphysical conclusions from *any* elements of their theories. Viewing elements of scientific theories as *representational* indeed is unjustified because it is not what the physicists themselves intend.

Let's address the latter issue first. Without question, many physicists are instrumentalists about their theories. A common view is that physical theories only tell you if you have a particular system you want to deal with, what sort of equations you should write down to be able to make predictions about its behavior, etc. Now, if the physics community as a whole were instrumentalists about their theories, then I grant there would be something seriously wrong with trying to using fundamental physical theories to inform metaphysical claims. Fortunately, physics as a whole makes it clear that what they are attempting to do is to construct an accurate theory about what the world is like.[14] Our metaphysical project depends on the attitude in general of the physics community being realist.

The indispensability arguments presuppose not only that we may draw metaphysical conclusions from our best physical theories, but that we may do so whenever we find indispensable representational elements. Here, even some scientific realists may balk. For even if we grant that the physics community as a whole intends to be engaged in the project of describing fundamental reality, of producing justified, true claims about the world, we may ask if it also follows that the physics community intends every representational element of its best theories to correspond to something in reality. This is an issue that was raised in a very compelling way by Penelope Maddy in a 1992 paper. Maddy discusses the state of the atomic theory of matter in the mid-nineteenth century. At this time the physics

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[13] There is a lot more discussion to be had on this issue of what versions of physical theory should inform metaphysics. One further reason in favor of the stance I take above has to do with the positive contribution of metaphysics vis-à-vis physics I discuss at the end of the paper. I will return to this issue there.

[14] Another matter altogether concerns the fact that many philosophers of science are anti-realists about scientific theory. To these philosophers, even if the scientists themselves think their theories are aiming to accurately represent the world, this itself is incorrect (e.g. Van Fraassen 1980). This philosophical issue (in contrast to the sociological issue discussed above in the text), about realism versus anti-realism deserves (and has received, though not by the present author) much discussion elsewhere. As should be clear from this essay, I side with the realists.

community had substantial justification for the atomic theory of matter, though many remained skeptical of the existence of atoms. As she elaborates:

> [A]lthough atomic theory was well-confirmed by almost any philosopher's standard as early as 1860, some scientists remained skeptical until the turn of the century – when certain ingenious experiments provided so-called "direct verification" – and even the supporters of atoms felt this early skepticism to be scientifically justified. This is not to say that the skeptics necessarily recommended the removal of atoms from, say, chemical theory; they did, however, hold that only the directly verifiable consequences of atomic theory should be believed, whatever the explanatory power or the fruitfulness or the systematic advantages of thinking in terms of atoms…. If we remain true to our naturalistic principles, we must allow a distinction to be drawn between the parts of a theory that our true and parts that our merely useful. (Maddy 1992, pp. 280–281)

A similar story played out in the mid-to-late twentieth century with the development of Gell-Mann's quark theory. The physics community was largely divided on the existence of quarks. Feynman showed his skepticism by preferring instead to label the constituents of protons 'partons'. As David Griffiths recounts the history, "by 1974 most elementary particle physicists felt queasy, at best, about the quark model. The lumps inside the proton were called *partons*, and it was unfashionable to identify them explicitly with quarks" (Griffiths 2008, p. 44) But eventually experimental evidence from the new particle accelerators confirmed the existence of quarks to the physics community's satisfaction.

Now, Maddy is not suggesting that metaphysicians hold off altogether in drawing metaphysical conclusions from fundamental physical theories. Eventually the physics community as a whole came to endorse the existence of atoms, though in Maddy's view this required the observational evidence of Jean Perrin in his experimental verification of Einstein's theory of Brownian motion. Indeed, Maddy seems to think (given the last sentence quoted above) that even when the physics community was reluctant to endorse the existence of atoms, they still had no problem endorsing other metaphysical ramifications of the atomic theory. So the issue is, even if we are scientific realists, should we endorse the indispensability arguments since the scientific community itself does not always take all indispensable elements of their best theories to have metaphysical significance?

To address this, it is worth asking what should the methodological upshot of this point be. If we grant that we want our metaphysics to be informed by current physical theory as it is endorsed by the physics community, then is the suggestion that we ought to seek out not merely those elements that are indispensable to current theories, but instead only those elements that are indispensable and taken to have metaphysical significance? Perhaps. In this case, we should modify the indispensability argument to read as:

> (P1′) We ought to have metaphysical commitment to all and only the entities, structures, or principles that are indispensable to our best scientific theories, *and taken by the physics community to have metaphysical significance.*

(P2′) X is indispensable to our best scientific theories, *and is taken by the physics community to carry metaphysical significance.*
Therefore,
(C) We ought to have metaphysical commitment to X.

However, I would note a couple of things. First, in both of the above examples—that of the atomic theory in the nineteenth century and the quark theory in the twentieth—it is not clear that these theories were actually accepted by the physics community as a whole. If this is the case in general, that when the scientific community is loathe to accept certain salient elements of their theories, they don't really accept the theory as a whole, then there would be no need to adjust the original formulation of our indispensability argument. Second, it will often be difficult to pin down the physics community on which aspects of the theories they are taking with metaphysical seriousness and which they are not. In this case, what does Maddy's point counsel? Are the elements of the best scientific theories innocent (existent) until proven guilty (non-existent), or vice versa? A preferred methodology for metaphysics would not have to answer these questions, and so this is a reason to prefer the initial characterization of the neo-positivist indispensability argument. However perhaps at this stage if we reach elements of a theory on which scientists themselves haven't issued a clear verdict, the metaphysician may think that the authority of the physicist runs out. The physicist gives us the theories, but we draw the metaphysical conclusions from them. This is not to go back on one's naturalism, but only to be cautious about how far the epistemological authority of science extends.[15]

5 Filling in the core

I have said that the search for indispensable elements of our fundamental physics should be the starting point of a neo-positivist metaphysics. Some would take it to be the end point as well. However, there seems clearly to be more work to do, once one settles on a core metaphysics. For each rival physical system will on its own contain more elements than those that are indispensable to physics. What is to be said about these remaining elements? To a certain degree, a neo-positivist ought to think that how we choose to "fill in" the core metaphysics will be up to us, something we have the freedom to decide based on our own preferences and ability to comprehend and make use of certain representational devices. And this means that if we are following the epistemological standards of logical positivists like Carnap, when we move beyond the belief in what is indispensable to our fundamental physical theories, we cannot pretend that these beliefs earn justification to the degree that it is reasonable to take them to be true. When metaphysics moves

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[15] One topic I don't engage here is the role of idealization in science. Even if scientific theory discusses ideal gases and frictionless planes, we shouldn't as metaphysicians accept such things into our ontology. My assumption is that it should be clear from the scientific theories themselves which representational elements correspond to idealizations and which do not. Perhaps the fiction of an ideal gas is indispensable to physics (though probably not to fundamental physics), nevertheless the existence of one will not be.

beyond what is justified on the basis of our own best physical theories, we only reflect our preferences for this or that way of filling in the core to produce a more complete metaphysical picture. Thus, it may be appropriate for the neo-positivist metaphysician, when moving beyond the core, to endorse an expressivism about her claims and say they aren't intended to assert something that is true or false, but instead express the attitude that such-and-such a metaphysics is preferred.[16]

As in the ethical case, projects extending beyond the discovery of what is or is not true can be conducted rationally. To see what I have in mind, let's fill out an example briefly mentioned above, of distinct formulations of quantum mechanics. As is well known among philosophers of physics, nonrelativistic quantum mechanics permits of many distinct formulations that are regarded as serious rivals by cross-sections of the physics community.[17] For example, two alternative formulations of nonrelativistic quantum mechanics (or perhaps, classes of formulations) are the Everettian (many worlds) theory and Bohmian mechanics. Both formulations have several representational devices and features in common. For example, both employ a device 'Ψ' to represent an object called the 'wave function.' Both are fully deterministic theories. So, if it turned out that these were the only two rival formulations of nonrelativistic quantum mechanics, then one should believe that a correct description of nonrelativistic systems should include an ontology of at least a wave function (whatever that is) and a set of laws that is deterministic. What I want to discuss in this section is the fact that the project of the metaphysician does not in general end here nor should it. For Everettian quantum mechanics and Bohmian mechanics have more to say about the world than merely what they have in common. And it is precisely in evaluating how one should choose between them that distinctly rationalist, armchair methods may come into play.

For example, although both Everettian quantum mechanics and Bohmian mechanics make use of a representational device 'Ψ' that both interpret as referring to a wave function, Everettians and Bohmians have distinct views about what this object is. A common view among Everettians is that the wave function is an object best thought of as a field that comprises the whole of the universe's physical ontology (see the essays in Saunders et al. 2010). On the other hand, Bohmians often have a very different way of understanding the character of this object they use 'Ψ' to refer to. They think the world at bottom is not ultimately reducible to the wave function. Instead they think the fundamental ontology of the world, what ultimately makes up everything else, is a plurality of particles. The wave function exists, it is an element of the Bohmian's ontology, but it has a different role to play than that of making up everything else. For the Bohmian, the wave function instead has a status

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[16] The suggestion is that the neo-positivist adopt an expressivism about those metaphysical claims that are not justified by the indispensability arguments analogous to what Blackburn (1984) and Gibbard (1990) offer for ethical claims. Price (2011) argues, for broadly positivist reasons, that we should adopt such an expressivism about all metaphysical claims. Unlike Price, I think that the justification physics gives us for some fundamental metaphysical claims does provide grounds for rejecting such a global expressivism, even if does support a more local version.

[17] See Albert and Ney (forthcoming) for more details on rival formulations of quantum mechanics and their metaphysical ramifications.

more like that of a law, of governing the behavior of the fundamental particles or matter in the universe.[18]

 As neo-positivist metaphysicians we may conclude (if these are the only two formulations of our theory that have earned acceptance among physicists) that the wave function exists, but given the variety of ways this entity is understood in rival formulations of nonrelativistic quantum mechanics, we do not have justification for making factual assertions about what sort of entity this wave function is. But this doesn't mean this should be the end of metaphysical inquiry. We can engage in reasonable debate about these rival positions. Is the wave function, as the Everettian wants to understand it,[19] the right kind of object to be able to ground the existence of all other (derivative) elements of one's ontology? Or should we instead insist that the fundamental ontology be something more like the particles of the Bohmian, because fundamental ontologies should include localized bits of matter rather than highly abstract entities like wave functions? Here, armchair methods may be used to assess the matter. First, do we have the ability to understand how our whole world, a world that includes macroscopic objects and minds, may ultimately be made up (in some sense) of a wave function? Our usual understanding of how fundamental physical objects make up macroscopic objects relies on a mereological sense of composition. Is it possible for the wave function to make up macroscopic objects using this notion? Are there other notions of composition on which the Everettian might draw?[20] Second, however an answer to the first question may play out, is it possible to make sense of this entity, the wave function, as in some sense like a law? What are the essential features we associate with laws? Perhaps laws are supposed to be exceptionless, contingent, universal, unchanging. Is it possible to construe the wave function as something that has these features?[21] Armchair methods enter here in two stages. First, work needs to be done investigating the nature of composition and the nature of laws. Work here will not proceed entirely from the armchair. Philosophers will need to pay attention to particular cases of composition in the world and particular cases of laws in science. But there will also be a lot of conceptual work to be done involving consideration of counterfactuals about what would we think if certain laws were proposed, or whether we could make sense of composition occurring in such and such counterfactual scenarios. As Steven French and Kerry McKenzie (forthcoming) emphasize, here metaphysicians may work at developing theories (of composition, or of laws) building a toolbox for use in working out the consequences of our best scientific theories. French and McKenzie emphasize an explicit analogy between the work of armchair metaphysicians vis-à-vis empirical metaphysicians/philosophers of physics and the work of mathematicians vis-à-vis physicists. As they put it, "it seems folly to try to predict in advance what will or will not prove useful to us in the course of time—a stance that should also be taken, of course, with regard to mathematical

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[18] The view I am describing is that associated with a certain prominent class of Bohmians and is further explicated in Dürr et al. (1992), Allori et al. (2008), and Albert and Ney (forthcoming).

[19] Here I am glossing over the fact that there is not really a univocal way the Everettian wants to understand the wave function. I am only trying to outline here one prominent approach.

[20] See Ney (forthcoming) for discussion of this issue.

[21] See Belot (forthcoming) for discussion of this issue.

structures and entities (such as imaginary numbers) and their role in natural science" (forthcoming, p. 3). Metaphysicians should be free to develop accounts of items like laws or composition, since they may prove useful later, in filling in the metaphysical consequences of our best physical theories.[22]

For more illustration, consider another feature that is shared between Everettian quantum mechanics and Bohmian mechanics: determinism. All fundamental dynamical laws of these two versions of nonrelativistic quantum mechanics are deterministic (as are the relativistic extensions of these theories that are currently available). From this, the neo-positivist metaphysician may conclude (believe and assert) with justification that determinism is true. However, this leaves open a further question. Although the Everettian and Bohmian's preferred set of fundamental dynamical laws are fully deterministic, they both also accept further principles connecting features of the wave function at a time with the results of experiments and these latter principles involve claims about probabilities, e.g. Born's rule. And so there is a further question beyond the status of determinism about the meaning of the probabilities in the theories. And here Bohmians and Everettians tend to have different views. Since Bohmians believe in the existence of particles in addition to the wave function, they tend to believe that these probabilities arise from ignorance about the location of the particles. Everettians, tending to believe there is only the wave function, tend to adopt different views about the meaning of these probabilities. Recently, a decision-theoretic approach to understanding the Born probabilities has become popular among Everettians.[23] Here again, armchair methods may come into play as we think through and argue about what is a coherent, plausible way to understand probabilities and what is not.

Neo-positivist metaphysics can benefit from rationalist methods on two fronts: (a) elucidating the conceptual entailments of those commitments that result from what is indispensable to physical science and (b) filling in the ontologies arrived at via indispensability projects. Insofar as the conclusions of (a) and (b) go beyond what earns justification through the indispensability arguments, they will only allow us to express our attitudes about what is or is not a satisfactory way to fill in the core metaphysics in which we are justified. What is satisfactory is not objective, and will plausibly depend on what we as human beings are contingently capable of understanding.

6 Should we wait for a final theory?

Above, I noted a few out of the many issues in metaphysics that meet the neo-positivist criteria I sketched above. I am not trying to argue these are the most

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[22] Here again, however, the issue of truth and justification is raised. This is something French and McKenzie do not address. When metaphysicians develop their theories of, say, what composition is or in what circumstances it occurs, or what a law is, is it possible using armchair methods to come to justified conclusions about these matters? Here again, perhaps neo-positivist will argue that such justification depends on the verdicts of our best scientific theories (what do all theories say composition is or a law is), or that here when armchair metaphysicians support this or that theory, they are only expressing a preference.

[23] For more on this topic, see Greaves (2007).

important issues to be handled by a neo-positivist metaphysics, only that these are some that strike me as extremely interesting. The methodology I am proposing requires careful engagement with physics itself in deciding what sort of representations have good claim to be truly indispensable and which do not.

For better or worse however, whenever we as metaphysicians think about looking to physics to inform our view of the world, we have to face the fact that physics as it now stands is unfinished. And today no one thinks that completing physics is only going "to require more and more precise measurement" as Lord Kelvin suggested in 1900. The issues today are much larger. Smolin (2007) has argued that "five great problems" remain in physics: combining general relativity and quantum theory into a single theory, solving the measurement problem, determining whether it is possible to unify all particles and forces in a theory that explains them all as manifestations of a single, fundamental entity, explaining what is responsible for the values of the free constants in nature, and explaining dark matter and dark energy (or giving an explanation of gravitational effects that would undermine reason for positing them). None of these are small endeavors. This thus raises the question of whether physics is in good enough shape for us to be drawing metaphysical conclusions from it.

A worry that gets noted sometimes is that our two best justified fundamental physical theories, quantum theory and general relativity appear to contradict each other. Here is Brian Greene on this issue:

> For many years, physicists found that the central obstacle to realizing a unified theory was the fundamental conflict between the two major breakthroughs of twentieth-century physics: general relativity and quantum mechanics. Although these two frameworks are typically applied in vastly different realms... each theory claims to be universal, to work in all realms. However,... whenever the theories are used in conjunction, their combined equations produce nonsensical answers. For instance, when quantum mechanics is used with general relativity to calculate the probability that some process or other involving gravity will take place... out of the combined mathematics pops an *infinite* probability... Probabilities bigger than 100 percent are meaningless. Calculations that produce an infinite probability simply show that the combined equations of general relativity and quantum mechanics have gone haywire. (2004, p. 16)

The absurd result of an infinite probability suggests definitely that these theories contradict each other, and so it is reasonable to conclude that one of them is false. This is fair. But does this mean we are unjustified in drawing metaphysical conclusions from fundamental physics? I would argue it does not. First, it is not clear exactly which are the elements of quantum mechanics and general relativity that are responsible for the problems Greene and Smolin note. We face a situation much like the preface paradox. Different approaches to developing a unified theory of quantum gravity result from physicists taking different attitudes to this question, and thus the philosopher should inherit this uncertainty about what needs to be given up to remove the problem. What we need not worry about however are the following two things. First, we need not worry that the absurd result removes the

justification we already have for quantum mechanics and relativity taken on their own as theories about what happens in their own paradigm domains (the very small and the very heavy). So we can infer justified things about what happens in these domains even if we cannot make universally quantified claims about what the correct mechanical principles are. Second, sometimes it seems that the worry with contradictions in fundamental physical theory is supposed to be one of the explosion of contradictions. If current fundamental physics has an internal contradiction, then since we know that contradictions imply anything, ontology informed by current physics is trivial. Fortunately, paraconsistent logics have been developed in the twentieth century that allow us to reason in the face of contradictions. And so we can rest somewhat easily that contradictions in fundamental physics do not trivialize the neo-positivist metaphysical project.

Not all of those who have expressed skepticism about basing metaphysics on current physics focus particularly on worries about contradictions. Ladyman (2007) worries about the problem of unifying quantum mechanics and general relativity, but his worry is not so much that the two theories contradict each other so much as that we know something will have to be adjusted to make the two theories fit together into a unified framework and we just don't know how that would go. He says, "This might suggest we should suspend judgement about the metaphysical implications of both theories until we see which are carried over to their successor" (2007, p. 14).

Again, I would reject the general tendency to approach the present state of physics in such a pessimistic way. The motivation for using physics to inform metaphysics is twofold. First, physics claims to be aimed at giving us a general theory of fundamental reality.[24] As Tim Maudlin has put it,

> Metaphysics, i.e. ontology, is the most generic account of what exists, and since our knowledge of what exists in the physical world rests on empirical evidence, metaphysics must be informed by empirical science. As simple and transparent as this claim seems, it would be difficult to overestimate its significance for metaphysics. (2007, p. 78)

Second, physics has a good claim to superior epistemic standing due to its use of mathematical precision, sophisticated experimental techniques, high standards for confirmation, and a discipline engaging in good practices like peer reviews of publications. Both of these claims apply to current physics. In fact, if anything we can only assume this holds for current physics, since we don't know all of this will even be the case for future physics. So, current physics is as good place as any to start a metaphysical inquiry. Our knowledge that something or other in physics must be changed for us to fulfill the five tasks Smolin describes does not change the fact that current physical theory is best placed to inform metaphysics. I would add that the unfinished state of current physics shouldn't be a disappointment to

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[24] At least this how physics justifies its endeavors to the world-wide community. For example, the following comes from CERN's website for its Large Hadron Collider (LHC): "Why? A good question… This is CERN's core business. With the LHC the aim is to continue to push our understanding of the fundamental structure of the universe." See http://lhc-machine-outreach.web.cern.ch/lhc-machine-out reach/why.htm.

metaphysicians. If anything, it opens up more promising areas of research in working together with the physicists to discover the consequences of rival formulations, perhaps leading physics to understand the various consequences of their theories better, and spur them on to new theoretical developments.[25]

7 Rivals

The approach I favor to neo-positivist metaphysics (metaphysics that is informed by and inherits the justification of science, and where it doesn't inherit this justification, it is explicit in this regard) is both more and less restrictive than some other proposals about how to do scientifically informed metaphysics.

Ladyman and Ross have proposed a particular stringent view about what a neo-positivist metaphysics may claim. They assert that:

> [N]o hypothesis that the approximately consensual current scientific picture declares to be beyond our capacity to investigate should be taken seriously. Second, any metaphysical hypothesis that is to be taken seriously should have some identifiable bearing on the relationship between at least two relatively *specific* hypotheses that are either regarded as confirmed by institutionally *bona fide* current science or are regarded as motivated and in principle confirmable by such science. (2007, p. 29)

The main project in metaphysics for them is thus a project of unifying specific scientific claims. Ladyman and Ross later go on to say more specifically that the only metaphysical hypotheses to be taken seriously should relate some specific hypothesis in one science to some other specific hypothesis in fundamental physics (2007, p. 44). It is not clear whether any of the major theses discussed in analytic metaphysics (realism or nominalism about abstract entities, regularity or counterfactual theories of causation, modal realism or fictionalism, psychological or physical views about personal identity, the A-theory or B-theory of time, three- or four-dimensionalism about the persistence of objects, monism or pluralism about fundamental ontology, compatibilism or libertarianism about free will) would count as hypotheses to be taken seriously according to them. It isn't just that they fail to meet Ladyman and Ross's first criterion. After all, some of these hypotheses may be approached empirically (perhaps). Still, even if there were means by which one could empirically establish the truth of say the B-theory of time,[26] this thesis would not meet the second criterion of being a hypothesis that has an identifiable bearing on the relationship between at least two specific scientifically confirmable hypotheses. Or at least, I cannot see which hypotheses these would be.

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[25] Note, coming back to the earlier discussion about which versions of current physics should inform metaphysics, that for metaphysics to play this positive role, it must be engaging with real versions of physical theories taken seriously by the physics community.

[26] And many have argued that the B-theory is indispensable to any theory that is going to obey special relativity.

Ladyman and Ross's negative view about so much of metaphysics seems to me untenable. Even if we cannot have any means of verifying and so being justified about all theses advocated by metaphysicians, there is still an important project of deciding which sort of completed metaphysics it is reasonable to endorse (given our preferences and contingent constraints on our own understanding) and which not. Ideally this should proceed from what we know any justified ontology must contain via the indispensability projects. At least this is the case if one is trying to narrow in on a framework that is likely to have relevance to true claims we can make about what our world is like. But, once one knows where to begin, much work can proceed from the armchair. As Katherine Hawley has noted in her critique of Ladyman and Ross's strict metaphysical methodology, there are many places where the neo-positivist needs the help of the so-called 'neo-scholastic' metaphysician:

> Much of what has lasting value in the metaphysical literature, as in many areas of philosophy, consists in the careful, detailed work of distinguishing conflated questions and issues, investigating the space of possible theories, and establishing relationships of confirmation or even entailment between different claims. (Hawley 2010, p. 176)

Hawley's point has much in common with the point of French and McKenzie noted above in their toolbox metaphor and analogy between armchair metaphysics and mathematics. What results is in Hawley's terms, a space of possible theories. Insofar as the metaphysician is discussing a topic on which our best scientific theories makes no claim, the neo-positivist metaphysician should withhold belief and assertion on the topic. She has insufficient justification to do so. However, she may nonetheless have attitudes about which overall theory is to be preferred and for which reasons. So long as she is clear about all of this, it is puzzling why she should withhold all consideration on the matter. When we infer our metaphysics from fundamental physics using indispensability arguments we can be sure to inherit justification for our metaphysics. But such a method will only deliver an incomplete metaphysics due to the existence of rival formulations with different elements. It does not seem irrational for one to try to fill in and complete a metaphysics. Where justification runs out, one only has one's preferences to go on. But so long as one recognizes this, one makes no mistakes.

At this point, it is perhaps worth asking why one cannot go further and conclude that metaphysics that goes beyond what may be justified on the basis of science (for example, to answer the special composition question, or decide on a correct interpretation of the probabilities in quantum mechanics) may be justified to the point where it is reasonable to believe its conclusions. Laurie Paul (2012) has stressed that there is a large class of issues that would require science to go through several conceptual revolutions to solve. Physics, at least as it stands, isn't in a position to address all topics of interest to metaphysicians according to Paul, and so she advocates a different sort of approach that metaphysicians should take to them, one that can allow them to make justified, true assertions about these topics.

Here her view is that even though we don't have *scientific* evidence favoring any view about these issues, we do get some empirical evidence about them from our experiences and observations of the world, including those in ordinary settings. Paul

emphasizes that we don't get enough information to draw a complete answer about these matters from experience, but we do get enough so that one shouldn't think such metaphysical theorizing proves completely detached from any empirical evidence. What metaphysicians can do in these cases is take this evidence and develop a theory. She says that here the metaphysician will proceed in much the way the scientist does in modeling their respective phenomena in using a significant amount of abstraction and idealization. Then after a theory is constructed, one can test the theory against intuitions and thought experiments. Ultimately, Paul argues, theorizing in metaphysics proceeds in much the same way as it does in science. She says:

> The theoretical desiderata we use to choose a theory include simplicity, explanatory power, fertility, elegance, etc., and are guides to overall explanatory power and support inference to the truth of the theory. A scientific realist should take such desiderata to be truth-conducive, since it is hard to see how such desiderata can lead us to truth if they are mainly pragmatic virtues. If such theoretical desiderata are truth conducive in science, they should also be truth conducive in metaphysics (and in mathematics). The main point I want to make here is that if the method can lead us to closer to the truth in science, it can lead us closer to the truth in metaphysics. (Paul 2012)

One difference between distinctively metaphysical theorizing and theorizing in science is that in science, many rival hypotheses are eliminated on the basis of experience. In metaphysics, the amount of information experience gives us on any of these phenomena (the nature of properties, material constitution, etc.) is so small that we end up with a far larger number of empirically adequate theories to choose from. For this reason Paul says, the choice between ontological theories must be determined largely by theoretical desiderata. Since she takes these theoretical desiderata to be truth-conducive however, we still have a means of selecting between rival theories to have good reason to believe that the theory in question is true.

I think Paul has succeeded in laying out how many naturalistically-inclined metaphysicians actually proceed. However, I would question whether such a methodology has the epistemic credentials we want. First, note how minimal the empirical data supporting rival views on the issues Paul discusses is. Consider the topic of properties. Could ordinary experience distinguish between any of the following views that are discussed by metaphysicians: realism about universals, class nominalism, resemblance nominalism, trope theory, etc.? I would think not. So it is not just that empirical evidence leaves a lot of views on the table, it leaves most or all views on the table, many of which diverge from each other in major ways. This thus leaves the bulk of the burden on weighing theories by the theoretical virtues. I agree with Paul that there doesn't seem to be justification for saying that while such virtues are truth-conducive in the case of science, they are not truth-conducive in the case of metaphysics. But I am not sure this helps her cause. The trouble is when you start with so little initial confirmation for one theory in a class of rivals, the theoretical virtues can't do much to bump this level of confirmation up. Consider a quasi-scientific analogy. Suppose that observation gave us some very

small reason for thinking that some planet's orbit was in the shape of a circle around its sun, and it gave some equally tiny reason for thinking that the planet's orbit was in some distinct, complicated shape S, and it gave us some equally tiny reason for thinking the planet's orbit was in another complicated shape S', and so on for very many hypotheses. Like I said, our empirical evidence is very, very small for each hypothesis. Let's grant that out of all of these many shapes, the circle is the simplest. I don't see that this would give us reason to think that we now have established this scientific hypothesis that the shape of the planet's orbit is circular. This isn't to say that the simplicity of the circle hypothesis doesn't increase its confirmation with respect to its rivals. But it seems a large stretch to say that when the empirical evidence is so small, we can appeal to the theoretical virtues and this will allow us to settle hypotheses. In science, we need a substantial amount of evidence to settle a hypothesis.[27] So it is with metaphysics. And so even if we may grant we can learn *something* about topics like the nature of properties and composition from experience, still the rationalist methodology Paul describes will not serve to settle metaphysical issues. We need more substantial empirical backing.

Despite all of this I completely agree with Paul that constructing metaphysical theories of the world in cases where physics doesn't settle on an answer is completely appropriate. As she puts it:

> It is simply naïve to think that the only appropriate role for metaphysics is to take on … assumptions about the nature of causation, properties, substances, and the like [from science] and then merely draw out implications of scientific conclusions. (Paul 2012)

This is a place of divergence from Ladyman and Ross. These modeling projects should be taken seriously not just by philosophers but by anyone who is interested in the ultimate nature of our world. But I think we must be clear when we do this that we are not asserting theses that are resting on a secure epistemic foundation. In building these models, we may be satisfying certain preferences we have for simple (or complex![28]), intuitive (or unintuitive![29]) theories, but we don't thereby come to have sufficient justification to have settled any issues.[30]

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[27] How much evidence, or whether the acceptance of scientific theories even proceeds in the way assumed here, is another issue.

[28] See the essays in Galison and Stump (1996) which may be viewed as a kind of polemic for constructing models of the world that are complex in many ways, emphasizing pluralities over unities.

[29] This has been a recurring theme in Dennett's work: "In most sciences, there are few findings more prized than a counterintuitive result. It shows something surprising and forces us to reconsider our often tacit assumptions. In philosophy of mind, a counterintuitive "result"… is typically taken as tantamount to a refutation. This affection for one's current intuitions, sometimes amounting… to a refusal even to consider alternative perspectives, installs deep conservatism in the methods of philosophers. Conservatism can be a good thing, *but only if it is acknowledged*." (2005, p. 34 my emphasis).

[30] Interestingly there are a class of cases for which Paul concedes this. Sometimes, she notes, there is an issue that it is really up to science to settle, but science isn't far enough along yet to be able to settle it. Here Paul argues that the metaphysician is free to construct models so long as she realizes that she doesn't have the justification to argue the views she comes to are true (Paul 2012). I am in agreement with Paul on this point. I would just argue that the same applies to the cases described in the preceding paragraphs.

8 Conclusion

In conclusion, I do not think that the label 'neo-positivist metaphysics' must be an oxymoron. I hope here to have outlined how a version of metaphysics may survive the genuine worries the positivists had about metaphysics. I agree with Jessica Wilson who says in a recent piece the following:

> Ultimately… Carnap's pessimism about metaphysics is grounded in a distinctly *epistemological* concern; and this concern easily survives the contemporary rejection of positivism and verificationism as adequate theories either of meaning or explanation. (2011, p. 178)

For epistemological reasons, the sort of neo-positivist metaphysics I have outlined here starts from serious engagement with current physical theory. This is the only legitimate place to begin if one is trying to accomplish at least one of the main tasks metaphysicians set for themselves—to establish conclusions about ultimate reality. This is the only place to begin if the claims of metaphysicians are to inherit the high level of justification of claims that are made in fundamental physics. As Carnap puts it,

> In order to discover the correct standpoint of the philosopher, which differs from that of the empirical investigator, we must not penetrate *behind* the objects of empirical science into presumably some kind of transcendent level; on the contrary we must take a *step back* and *take science itself as the object*. (1984, p. 6)

The best way to have science inform a project of metaphysics is for us to seek what sorts of representational devices are indispensable to physics. I have tried to show as well that this does not exclude a role for rationalist methods in metaphysics, both in working out the entailments of what is indispensable to scientific theory and in filling in the picture that science gives us. In this sense, Ladyman and Ross who are very skeptical of the role of intuitions and other a priori methodology in metaphysics are too restrictive in their characterization of what metaphysics ought to be. And in case one worries that a methodology that leaves room for rationalist methods is something Carnap and the positivists would out-and-out reject, I offer the following passage for consideration:

> Our conjecture that metaphysics is a substitute, albeit an inadequate one, for art, seems to be further confirmed by the fact that the metaphysician who perhaps had artistic talent to the highest degree, viz. Nietzsche, almost entirely avoided the error of that confusion. A large part of his work has predominantly empirical content… In the work however, in which he expresses most strongly that which others express through metaphysics or ethics, in *Thus Spake Zarathustra*, he does not choose the misleading theoretical form, but openly the form of art, of poetry. (1932, p. 80)

Recall the earlier passage in which Carnap says that metaphysics really can only express one's "general attitude to life," insofar as its claims are incapable of analytic or empirical verification. In this way, Carnap likens metaphysics to art.

In his approval of Nietzsche's methods, one can read Carnap as presenting the metaphysician with two options. He or she may keep one's claims limited to what can be verified or come out and be explicit that what one is giving one's reader is only an expression of a general attitude. I don't agree with Carnap that it would be a good idea for all of those engaging in rationalist metaphysics (in particular the filling in projects I described above) to present their work in the forms of poetry or novels, but I do agree that we should be more explicit and careful about when our positions lack empirical support and therefore are being proposed as something closer to a preference or attitude.

It is often asked, if naturalism or physicalism is the right stance to take in understanding the world, then what can the metaphysician contribute? Indeed according to the proposal I make here, it looks like the metaphysician can only read off the entailments of physics or merely express her preferences based on contingent features of her own cognitive situation. What I want to suggest in conclusion is that it is precisely the fact that physics is not yet complete that metaphysicians right now have something to contribute. In expressing what they take to be the best ways of filling out current physics, of working through these theories' implications and trying to understand them, this can help the physicist better understand her own theories. Indeed this may give the physicist reason to favor one or another avenue in developing and extending current theories or revising them. Physics is a dynamic enterprise, not a static set of principles, and this is what gives the metaphysician the opportunity to make a genuine contribution, making her contributions very far from illegitimate, shallow, or trivial.

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