Towards a New Account of Progress in Metaphysics: The Tool Building Approach

Dylan Goldman

UC Davis

1 Introduction

How does scientifically informed metaphysics make progress? One response is that scientifically informed metaphysics makes progress off the back of science. If science makes progress, then so too does the metaphysics based on that science. Some argue that there is a problem with this line of reasoning. Kerry McKenzie claims that metaphysics cannot make progress off the back of science because metaphysical theories cannot approximate the truth like science can. She concludes that metaphysics based on science cannot make progress even in principle. In this paper, I use McKenzie's argument as a jumping-off point from which to make two claims. First, I claim that metaphysics is capable of making progress on a known account of scientific progress, the truthlikeness account. Second, I present the groundwork for a new account of metaphysical progress, which I call the 'tool building approach'.

1.1 Progress in Philosophy

There are various understandings of the kind of progress philosophy could make. It is unclear whether our understanding of philosophical progress should be like our understanding of progress in the arts or if it should be understood like the type of progress science might make. Moody (1983) distinguishes three kinds of progress.[1] $Progress_1$ (as Moody calls it) is progress

[1]See Moody (1983) pp. 35-26.

towards a specific decidable goal, where an observer can decide with confidence whether progress has been made in a given case. For example, a runner getting closer to her goal of a specific mile time would constitute $progress_1$. $Progress_2$ is the kind of progress towards an unspecified goal and where the criteria for progress might be subjective. Moody thinks an artist is guided by a non-arbitrary inner sense of progress despite there not being an objective criterion to determine whether progress has been made. So, $progress_2$ applies to disciplines where there is not a clear goal, and the criteria for progress is subjective, but there's a non-arbitrary determination of progress from the sense or intuition the discipline's practitioners. Moody takes $progress_3$ to be a hybrid between $progress_1$ and $progress_2$. $Progress_3$ is characterized by decidable intermediate goals, such that a practitioner can know that they are making progress in intermediate steps in a more objective way than $progress_2$ but there is no obvious goal of completion.[2]

Moody believes that science and math are $progress_3$ activities in that math makes progress by finding solutions to discrete problems while not necessarily having a decidable end goal. The same applies to science. Philosophy, according to Moody, is a $progress_2$ activity. His reasons for that are not relevant to this paper so I will not go over them. However, Moody's three precisifications of different kinds of progress are useful for understanding the kind of philosophical progress that this paper is about.

This paper focuses on progress in metaphysics and not all of philosophy. The account of progress I offer in this paper is progress that is characterized by the extent to which metaphysics approaches a decidable goal. The decidable goal is the true fundamental metaphysical theory. In this way, metaphysically is most like $progress_1$. I then take it that metaphysical progress is constituted by increasing achievement towards the true metaphysical theory. Kerry McKenzie characterizes progress in the same way but is pessimistic about the possibility of progress in metaphysics. I will use her argument as a jumping off point for the new account of progress that I will eventually suggest. First, I'll present her view of scientific progress as it is crucial for understanding her view of metaphysical progress.

[2] *ibid* Moody (1983).

1.2 How Physics Makes Progress

For this paper, I will discuss McKenzie's claim regarding naturalistic metaphysics. She characterizes the naturalistic metaphysician as those who accept both of the following claims:

(NM+): Metaphysics that is informed by science is worth doing.[3]

(NM-): Metaphysics not informed by science is not worth doing.[4]

By "worth doing" McKenzie means discovering the truth about the world. This is important to clarify since one might think that disciplines have overall value even if they do not discover the objective truth of the world (e.g. art, literature, etc.). McKenzie is thinking of "informed by science" in a particular way where metaphysicians interpret our best scientific theories to discover the structure and properties of the world. The naturalistic metaphysician would look to quantum field theory and general relativity for our most fundamental physical theory and to biology for our ontology of organisms, colonies, environments, and so on. It is important to note that this is not the only way of doing naturalistic metaphysics.[5] There are many ways to normatively characterize naturalistic metaphysics, but the many precisifications should not significantly affect the claims in this paper. It is only important for our purposes that the category of naturalistic metaphysics is understood as metaphysics that is primarily motivated by scientific theories.

Now I'll explain McKenzie's view of scientific progress. In order to do this, we have to understand the problem of theory change that potential progress in science faces. She focuses her discussion on physics. Strictly speaking, every past physical theory is false. We know that Kepler's theory of planetary motion, Galileo's theory of the solar system, Newtonian mechanics, relativity, and even quantum mechanics is strictly false.[6] Moreover, our understanding of various theoretical posits, like the atom and light, has changed dramatically over the history of science

How, then, is it true that physical theories are getting closer to the final true theory? A popular answer, McKenzie contends, is that scientific theories

[3] *ibid,* pp. 4.

[4] *ibid,* pp. 2.

[5] For example, Ladyman et al. (2007). Ladyman and Ross (2008) advocate for a kind of naturalistic metaphysics expressed by their principle, the Principle of Naturalistic closure.

[6] See Laudan (1981) for a review of the radical changes in ontology in physics.

are approximately true. Approximate truth is the idea that a proposition can be false but close to the truth. Consider the proposition that there are 10 million planets in the solar system and the proposition that there are 9 planets in the solar system. Both are false but the second is very close to the truth and thus is approximately true or more approximately true. McKenzie thinks physics makes progress by its newer theories being better approximations to the truth than older theories. She thinks that this is done in a particular way, by the newer theories in physics standing in what she calls a "correspondence relation" with older theories. The correspondence relation has its roots in Post (1971), where he describes the general correspondence principle as a heuristic for progress. The correspondence relation obtains when a new theory, call it N, accounts for the success of an older theory, call it O, by degenerating into that theory in the domain in which the old theory was well confirmed.[7] McKenzie describes the correspondence relation in the following:

> In this context, a pair of theories 'correspond' if the central equations of the old theory are retained as approximations to those of the new theory, when applied in the domains in which the old theory was empirically well-confirmed.[8]

To illustrate correspondence between theories, McKenzie gives the example of the Lorentz transformation, which was a part of the shift from classical mechanics to special relativity. Within the range of practical scenarios (where velocity is much less than the speed of light), the Lorentz equation yields the same solutions as the central equations of classical mechanics.[9] She says,

> Conversely, however, when the difference between their velocities is small compared to the speed of light, the v^2/c^2 term reduces to a trifling little fraction; for virtually all practical purposes, then, the denominator stays close to unity. Thus in the limit in which v=c tends to zero the Lorentz transformation deforms, to a very good approximation, to the pre-relativistic expression.[10]

[7] See Post (1971), pp. 227.
[8] *ibid,* McKenzie pp. 9.
[9] *ibid.*
[10] *ibid,* McKenzie pp. 10.

It is important here to be clear that understanding approximate truth as applying to theories when they stand in the correspondence relation is a particular way to understand approximate truth. When I first explained approximate truth, I said that the proposition that there are 9 planets is a better approximation to the truth than the proposition that there are 10 million planets. Note, though, in this case, the propositions do not have central equations that degenerate into each other in limited cases. At the moment I do not want to get into the relationship between approximate truth in general and McKenzie's notion of progress, so I will just understand her view of scientific progress as the specific correspondence account mentioned. She specifies her view on the matter:

> Further, since the correspondence between theories that we find in practice generally requires us to view previous theories as at best approximations to the truth, we can speak of progress in physics as being at best the production of better approximations.[11]

So, McKenzie thinks that physics can escape the problem of theory change by its older and newer theories maintaining a relation of correspondence with each other.

2 Why Metaphysics Allegedly Cannot Make Progress

So far, I have explained why McKenzie thinks that physics makes progress despite theory change. Now we turn to her claim that naturalistic metaphysics cannot make progress on the back of progress in physics. That is, I'll explain why McKenzie thinks that even though successor physical theories make progress on past physical theories, naturalistic metaphysical theories cannot analogously make progress.

Her reason is simple. McKenzie holds that metaphysical theories cannot stand in the appropriate correspondence relation because metaphysical theories are not mathematical. Metaphysical theories like nominalism, platonism, perdurantism, wave function realism, just to name a few, simply do not have central equations that can degenerate into other theories' central equations

[11] *ibid.*

when taken to a limit. Thus, metaphysical theories, even naturalistic ones, fail to be candidates for McKenzie's understanding of approximation.

Moreover, she thinks metaphysical theories cannot approximate other metaphysical theories because of the generality of the subject matter in metaphysics. Let's look at the example from naturalistic metaphysics that McKenzie uses, Ontic Structural Realism (OSR). She takes OSR to be the thesis that relational structure is ontologically more fundamental than objects. Take the alternative thesis that fundamentally there are only entities with intrinsic properties and spactiotemporal relations; call this view "Humeanism". Humeanism is inconsistent with OSR and thus these theses are rivals. OSR is largely based on interpretations of our current best science—quantum mechanics. From the history of theory change, we know quantum mechanics is not fully true and not the final physical theory. Eventually then, physics will adopt a successor theory to quantum mechanics, call it theory S. It is very possible that theory S provides evidence for a different metaphysics than the metaphysics that quantum mechanics supports (given how much the ontology of scientific theories has changed). It is possible that S gives us reason to think Humeanism is true. So, our metaphysical theory went from OSR to Humeanism. Now the question is whether OSR is approximately Humeanism. McKenzie argues that it clearly is not. The two theories can be stated as negations of the other, where Humeanism can be thought of as "it is not the case that only relational properties are fundamental, since there is at least one intrinsic property at the fundamental level". The theories do not degenerate into each other in a range of cases (i.e. correspond) and there is just not an obvious sense in which Humeanism is a refinement or revision of OSR.

McKenzie argues that the example generalizes to all of metaphysics because competing metaphysical views are negations of one another. She says:

> Just as with the last case, this it seems is but an instance of a more general phenomenon of metaphysics. For the paradigmatic properties of metaphysics, which are typically second-order properties, tend to be defined in mutually exclusive and jointly complete pairs, so that we tend to contrast them with nothing but their logical contrary. [...] Think of objective / subjective as mind independent or not, or fundamental / non-fundamental as dependent or not, abstract / concrete as causal spatiotemporal or not, universal / particular as multiply instantiated or

> not, normative / natural as prescriptive or not. Indeed, the fact philosophers typically argue over whether the world is either one way or its opposite is presumably part of why Kant was able to surmise the history of metaphysics as a hopeless quest to resolve antinomies.[12]

Here McKenzie claims that metaphysical concepts admit of the world either being one way or the other. In metaphysics, we will often attribute an entity as being mind-independent or dependent, fundamental or non-fundamental, intrinsic or extrinsic, and there is no middle ground between the two conceptual options. The story here is that theories in physics can make progress because new theories can be approximate forms of old theories, in virtue of the mathematical structure of physical theories. Metaphysical theories cannot make progress because they are not mathematical, and the language of metaphysical theories preclude a kind of "closeness" between theories. There is no sense in which Humeanism is an approximate form of ontic structural realism, for example.

To use McKenzie's analogy, if we think of progress as climbing a mountain where the true theory is at the summit, Newton's theory of gravity is like climbing a bit up the mountain, general relativity like climbing a little bit more, and the successor theory of gravity will be like climbing even higher. Not making it all the way to the summit is not a failure, and making it half way gives you a partial view of the true summit view. McKenzie thinks the approximate truth of scientific theories is like this story. She contends that not having the final theory in metaphysics, however, is like being on the completely wrong mountain. In terms of the goal, there is not a sense in which metaphysicians partially achieved it. Before we have the final physical theory, our metaphysical theory is possibly so mistaken that we do not even partially achieve our goal.

For the remainder of this paper, I will defend progress in metaphysics from McKenzie's charges. I will first argue that metaphysics can make progress on an established account of scientific progress: the truthlikeness account. The first account of progress might be satisfactory for some but will not fully assuage McKenzie's worry. It will still not seem like we are getting closer to the summit of the mountain, the true metaphysical theory. **Section III** will resolve this problem by providing a novel account of metaphysical progress.

[12] *ibid,* McKenzie pp. 8.

Specifically, the account will specify the value of developing false metaphysical theories that are discontinuous with the final metaphysical theory.

3 Truthlikeness Account of Progress Applied to Metaphysics

My contention in this section is that naturalistic metaphysics can make progress by its newer theories becoming more truthlike than older theories. Let us call this "the truthlikeness account of progress." This account is meant to be general but can be captured more specifically with numerous accounts.[13] Here is a specific characterization based on Niiniluoto's account:

> The truthlikeness of a scientific theory T is defined relative to a language L as a measure of the similarity between a maximally specific claim C* in L, that fully captures everything that is true, and a disjunction of other such maximally specific claims (C1V...VCn) that captures the content of T by effectively listing all the maximally specific possible states of affairs allowed by T.[14]

In other words, the truthlikeness of a theory is proportional to how similar maximally specific claims allowed for by that theory are to the true maximally specific claims about the world (C*). This approach is apart of the 'likeness' approach to truthlikeness, developed by Tichỳ (1978) and Hilpinen (1976). It was later developed by Niinilihuoto, whose account of truthlikeness I will consider standard. Hilipen thought of scientific theories as sets of possible worlds, and Niiniluoto slightly revised Hilipen's account by replacing possible worlds with constituents.[15] Given a first-order language L, constituents are maximally informative descriptions in L of the possible worlds that a theory allows for. A theory in L is represented by a disjunction of constituents. I should also note, according to Niiniluoto, truthlikeness of theories should apply on the syntactic and semantic view of scientific theories.[16]

According to Niinilihuoto, the degree of a truthlikeness of a theory is determined by how close any one of its disjuncts are to the true state of

[13] See Dellsén et al. (2022), Popper (1963).

[14] *ibid,* Dellsen et al pp. 9.

[15] See Niiniluoto (2010) for a full discussion of this

[16] Niiniluoto (2010).

affairs, while also excluding serious falsities.[17] There is dispute about how to exactly measure the closeness of the constituents of a theory to the true constituent. Tichy and Oddie advocated for the average distance of the constituents to the truth (of each disjunct), while Niiniluhuoto advocated for the min-sum measure (i.e. the weighted combination of minimum distance and the sum of all distances). The dispute over how exactly to measure the closeness of the constituents of a theory to the one true constituent should not matter for our purposes. The general intuitive standard of including as many informative and true propositions while minimizing false propositions shall suffice for comparing metaphysical theories.

Following McKenzie, let's look at the example of Humeanism versus ontic structural realism to apply the truthlikeness account of progress. Take Humeanism to be the Lewisian claim that there is fundamentally a mosaic with objects or spacetime points possessing perfectly natural and intrinsic properties and there exists spaciotemporal relations between them.[18] Take OSR to be the thesis that fundamentally there are only extrinsic relations or structure as represented by quantum states.[19]

Say OSR is the true theory. Is the Humean claim that 'there are perfectly natural and intrinsic properties at the fundamental level' false? Clearly the answer is yes. OSR holds that there are only extrinsic properties at the fundamental level. However, is Humeanism closer to OSR than an older metaphysical claim, like Aristotle's Hylomorphism, which dictates that entities are fundamentally composed of form and matter?[20] According to McKenzie, this question is incoherent since the language of metaphysics does not allow for approximation. This is because the concept of intrinsic is just the opposite of extrinsic, and Humeanism says the fundamental properties are intrinsic while OSR says that extrinsic relations are fundamental. In my view, we can determine the relative truthlikeness of metaphysical theories by analyzing their specific commitments and comparing their similarity.

Dellsén et al. (2022) explicate various philosophical accounts of progress in science and apply them to philosophical progress. One of them is the truthlikeness account. In the following they discuss how truthlikeness may be applied to metaphysical claims:

[17] See Niiniluoto (2010) pp. 194.

[18] See Lewis et al. (1986).

[19] Note how Ladyman doesn't think there's a fundamental level but this should not matter.

[20] Aristotle et al. (1984).

> The theory that lying is sometimes wrong is less informative than the theory that lying is wrong whenever an alternative course of action would lead to a greater balance of pleasure over pain, the latter theory may well be more truthlike than the former, even if utilitarianism is false.[21]

Here their discussion focuses on the fact that truthlikeness requires a balance between accuracy and informativeness.[22] Their claim is that the more accurate claim that "sometimes lying is wrong" is actually less truthlike than the more specific and less accurate utilitarian claim because the contents of the latter claim constitute a better balance of informativeness and accuracy. A clearer case of this is comparing a tautology to a false but informative claim. "There is a planet or there is not a planet in the solar system" is more accurate than the claim that "there are 9 planets in the solar system" but the latter is more truthlike because its content exhibits a better balance of informativeness to accuracy. There are two lessons from this. First, it's clear that Dellsen et al agree that philosophical claims (and likely metaphysical claims as well) are capable of being more truthlike than other philosophical claims. Second, in applying truthlikeness to metaphysical claims, we should keep in mind this balance between accuracy and informativeness.

Let's apply truthlikeness to Aristotelianism, Humeanism, and OSR. Again, to compare the truthlikeness of claims, we compare a disjunction of each maximally specific states of affairs that is compatible with each claim.

Aristotle's theory of hylomorphism holds that objects are made up of matter and form. Aristotle posits two aspects, matter and form, in order to account for change in things. Matter plays the conceptual role of being the underlying thing that continues through "substantial change", like when an organism dies and its matter is dispersed.[23] Form plays the conceptual role of a things essence, thought of by properties the thing instantiates.

Since we're assuming OSR is the true theory, we should compare the truthlikeness of Humeanism and of Aristotelianism to it. As a reminder, that means we take the disjunction of each maximally specific state of affairs allowed for by each theory and compare each disjunct to the true maximally specific state of affairs, which includes the thesis of OSR. Remember, I take

[21] Dellsén et al. (2022) pp. 14.

[22] This way of determining truthlikeness follows Niinuoloto's approach.

[23] see Aristotle et al. (1984).

"maximally specific state of affairs" to be context relative.[24] For Humeanism, OSR, and Aristotelianism, the relevant states of affairs will be the facts regarding the fundamental.

> **Hylomorphism**: (fundamentally there are intrinsic properties, form and matter, and spacetime is not fundamental, and foundationalism about fundamentality is true, etc.) $\vee$ (fundamentally there are extrinsic properties and form and matter, and spacetime is not fundamental, and foundationalism about fundamentality is not true, etc.) $\vee$ (every other proposition about the fundamentalia that is consistent with Hylomorphism).
>
> **Humeanism**: (there fundamentally exists space-time points with perfectly natural and intrinsic properties and spaciotemporal relations between those space-time points, and foundationalism about fundamentality is true and the fundamental is a supervenience base for everything else that exists, and there are n spacetime points or objects that exist, etc.) $\vee$ (there fundamentally exists objects with perfectly natural and intrinsic properties and spaciotemporal relations between those objects and foundationalism about fundamentality is true and the fundamental is a supervenience base for everything else that exists, and there are n+1 spacetime points or objects that exist, etc.) $\vee$ (every other proposition about the fundamentalia that is consistent with Humeanism).
>
> **Ontic Structural Realism**: (There fundamentally exists extrinsic properties represented by the quantum state and there **are not** fundamental intrinsic properties and everything else depends on the fundamental structure, etc.).

The few disjuncts I chose to include with each claim are just a couple of examples of the states of affairs compatible with each theory with respect to facts about the fundamental. Which disjunction is most similar to the true conjunction (OSR)?

Recall, to compare the truthlikeness of claims we have to balance accuracy with informativeness, following Dellsén et al. (2022) and standard

[24] In the example Dellsén et al. (2022) give regarding the truthlikeness of a moral theories, they also restrain what states of affairs that are contained within each disjunct to those relevant to the target of analysis.

accounts of truthlikeness.[25] It's unclear how to assess the accuracy of Hylomorphism, given that it's so general. There is a sense in which Aristotle intended form to play the conceptual role of essential properties of things, such that when a thing undergoes change it will maintain its form when it maintains its essential properties.[26] It is possible to think that fundamental entities have essential properties on OSR, so long as those properties are extrinsic. However, if the form of entities is meant to be an intrinsic property, then the thesis would be inaccurate, because OSR denies that fundamental individuals (like quantum particles) possess intrinsic properties. If the concept of form is meant to only apply to higher-level or macro entities, then this may be consistent with OSR. The issue here is that the concept of form and matter is unspecific, and thus could be accurate upon some interpretations.

Humeanism makes much more specific commitments than Hylomorphism. As the thesis that there are fundamental objects or spacetime points with intrinsic properties, Humeanism requires a commitment to the global framework of reduction via the supervenience claim of the thesis. That is, the commitment that *all* facts supervene on the fundamental mosaic demands one to reduce all facts (besides modal facts) to the mosaic, and this is a demanding task. Humeanism is thus a much more specific and committing thesis than the thesis of Hylomorphism. Moreover, the way in which Humeanism is precise makes it more similar to OSR and thus more informative. For one, OSR, as construed, is a thesis about the relationship between the fundamentalia and non-fundamentalia, or at the very least OSR makes a claim about relative metaphysical priority. As said, Hylomorphism is not necessarily a thesis about relative priority. Second, OSR is a thesis about the dependence or relationship between extrinsic/intrinsic properties and entities. Humeanism is also a thesis about the dependence or relationship between extrinsic/intrinsic properties and entities (though OSR and Humeanism conflict on which properties are fundamental). Hylomorphism is neutral in this respect. In conclusion, because Humeanism is a more precise and committing thesis with respect to OSR, it is a much more informative theory than Hylomorphism (assuming OSR is true). Even though Humeanism is in direct conflict with OSR while Hylomorphism is not, in my view, Humeanism constitutes a better balance of informativeness and accuracy and is thus more truthlike. Thus, if researchers adopted Hylomorphism, then Humeanism,

[25] See Dellsén et al. (2022) and Niiniluoto (2014).

[26] See Ainsworth (2016).

and lastly OSR, metaphysics makes progress because its theories increase increase in truthlikeness.

Now, compare Aristotelianism to a different metaphysical thesis like Platonism, which holds that there fundamentally exists a platonic heaven of perfect forms. Aristotle denies platonic forms and unlike the rest of the considered views, Platonism is incompatible with physicalism. Hylomorphism, all things considered, is closer to OSR than Platonism since Platonism scores lower on both informativeness and accuracy than Hylomorphism. Again, there is an increase in truthlikeness. If the order of theory acceptance was Platonism to Aristotelianism to Humeanism and lastly to OSR, the theories of metaphysics are becoming more truthlike (and eventually true). This means that there is progress according to the truthlikeness account.

Would we then say that Aristotelianism is approximately true? Is Arisotelianism approximately OSR? Dellsén et al. (2022) distinguish approximate truth and truthlikeness by pointing out that approximate truth only takes into account accuracy while truthlikeness also takes into account informativeness.[27] The concept of approximate truth, in my view, is also about success or sufficient similarity to the truth. The reason that Newtonian mechanics is approximately true is that it is sufficiently continuous with its successor theory, relativity, and relativity will be sufficiently continuous with its successor theory. In virtue of this continuity, it makes sense to claim that Newtonian mechanics is approximately true with respect to the final theory of gravity, given that there is sufficient similarity along each step of scientific theory change. Indeed, this is likely why McKenzie emphasizes the correspondence relation between theories in order to think about approximate truth.

Given this notion of approximate truth, it's unclear how the claim that entities are composed of form and matter is approximately the claim that there is a fundamental structure expressed by certain scientific laws. McKenzie is right that these claims just seem completely different. When thinking about scientific theories, it might be apt to think that old scientific theories are approximately true because they are continuous with future theories in the domain in which they are well confirmed—i.e. they correspond with future theories. The metaphysical theories currently under consideration are not similarly capable of correspondence or similarity. Indeed, McKenzie seems right that the drastic difference in meaning between metaphysical theories reveals that, in general, metaphysical theories cannot approximate each other.

[27] *ibid*, Dellsén et al. (2022), pp. 8.

Interestingly, what this means is that the concept of progress via increase in truthlikeness and the concept of approximate truth are separable notions. It seems simultaneously true that metaphysical theories are increasingly more truthlike and that old metaphysical theories are not approximately true. Indeed, even the penultimate theory, Humeanism, does not seem approximately true. The final picture, OSR, is different enough from Humeanism such that the claim that Humeanism is approximately true is implausible. It is much less controversial, however, to think that Humeanism is at least more truthlike than Aristotelianism or Platonism.

Thus, theories in metaphysics can become more truthlike over time, but false metaphysical theories are not approximately true. Now the question is: is this good enough for progress? I think one can reasonably answer this question either way. The aim of the discipline is truth, and theories in metaphysics are getting closer and closer to that aim. Theories are getting better with respect to the aims of the discipline. One might think this is a fine standard for progress. There's a sense in which metaphysical theories, like those discussed, are dramatically changing such that one who holds a Humean view has a very different picture of the world than the OSRist. Nonetheless, Humeanism was an improvement, in terms of truth, from prior theories.

Those who share McKenzie's worries would surely not be satisfied though. The picture of metaphysical progress, so far, judges there to be progress where one metaphysical theory is more truthlike than a past metaphysical theory even if those theories present very different representations of the world. This picture seems close to the one of 'displacing theories' that McKenzie wants to rule out with an account of progress. She says:

> But if each theory is so radically different in what it has to say about the way that the world fundamentally is, there is the worry that all one can find here is displacement, us believing one thing and then another ostensibly totally different thing. So how can we maintain that here our knowledge grows – hence that something is retained through these changes?[28]

McKenzie clearly thinks that there needs to be a sufficient similarity, or retention of content or structure, between theories. This is why she uses the correspondence account to think about approximate truth. Theories

[28] *ibid,*McKenzie pp. 8.

correspond if their central equations degenerate into each other in the range of scenarios where the old theory was well confirmed. Correspondence between theories guarantees their sufficient similarity. What's the thought behind this requirement for progress?

Think back to the mountain analogy of progress. We make progress by climbing up the mountain because even before we reach the summit, we receive an approximate version of the summit view. If the summit view is the full truth, there is value (in terms of truth) in climbing up halfway even if we never reach the summit. McKenzie charges that theory change in metaphysics is not like we are climbing up the mountain at all because metaphysical theories cannot be approximately true. Even though I've argued that metaphysics can make progress on the truthlikeness account, it still seems right that theory change in metaphysics is not like climbing up the mountain. Metaphysical theories are not sufficiently similar to each other to warrant that false theories are an approximate version of the truth. Even though Humeanism is more truthlike than past theories, shifting from Humeanism to OSR is still an instance of displacing theories in virtue of the fact that they are very different representations of the world.

Another way of thinking about the worry of displacing theories is that if our current theories are going to be displaced (i.e. replaced by radically different theories), it seems pointless to metaphysically theorize before we have the final physical theory to theorize about. Our metaphysical accounts of the world may be getting more truthlike, but given how different our metaphysical theories are, what's the value in developing robust metaphysical accounts of the world if we are just going to displace them with drastically different accounts come a new physical theory? This worry I am sensitive to. Indeed, the next section is meant to be a direct response to this problem.

4 Why Do Metaphysics Before the Complete Physical Theory?

In this section, I offer a novel account of the value gained in metaphysical theorizing before we have a complete physical theory.

I contend that there is value in doing metaphysics along the way to the final physical theory because we develop and gain indispensable knowledge of metaphysical tools. I'll specify what I mean by "metaphysical tools" before

turning to the example where they are applied.

4.1 What Are the Tools of Metaphysics?

Concepts distinctly metaphysical or often used in metaphysical analyses or debates are part of the metaphysical toolkit as I mean it.[29] Here is a non-exhaustive list of examples: a priori/a posteriori knowledge, necessary and contingent truth, analytic and synthetic truth, rigid and unrigid designators, *de dicto* and *de re* propositions, ground, determination, dependence, essence, composition, parts and wholes, real definitions, logical operators, and so on. Individual concepts are only part of the toolkit, however. It can also include general models, like an account of possible worlds, or methodological knowledge, like knowledge about which facts from scientific theories count as evidence for metaphysical theories and how we ought to choose between metaphysical theories in general. I will explain each of these throughout this section.

Sider (2020) discusses the historical developments in the tools of metaphysics. He notes that metaphysical inquiry was done through an analysis of language in the era of positivism in the early 20th century. With the demise of positivism came the rise of analyzing metaphysics through modality with Lewis and Kripke.[30] Accounts of *a posteriori* necessity and supervenience were developed, along with global models like Lewisian possible worlds and supervenience. These concepts and models were then applied to a number of metaphysical issues like reduction of higher-level entities, the relationship between the mind and the body, persistence of objects and identity, and discussions of the supervenience base of the world. Lastly, Sider thinks metaphysics has shifted to a post-modal focus, where instead of using modal concepts like necessity and supervenience, metaphysical analyses are made with hyperintensional concepts like ground, essence, and dependence. Other metaphysical concepts more recently developed include determinate and determinable as they relate to accounts of vagueness. The various tools Sider discusses and used throughout the history of metaphysics should be included in the toolkit.

Sider's discussion only specifies concepts and frameworks that would be included in the metaphysical theories themselves. Call these first order tools.

[29] I borrow the toolkit metaphor from Sider (2020).

[30] See Lewis et al. (1986) and Kripke (1980).

There also exists what may be called second order tools, or metametaphysical frameworks, such as the debate regarding what ought to be the structure or language that our metaphysical theories are given in. Traditionally in analytic metaphysics, dating back to Russell, proper metaphysical theories are meant to be stated in predicate logic, such that the theory clearly states which objects exist and the logical relations between the objects.[31] More recently, (e.g. Wallace (2022)) there have been suggestions of metaphysical theories being stated in more directly mathematical ways so to be congruous with how we should interpret science. The debate here is not about which appropriate first order concepts are to be included in our theories, but rather how should our theories in metaphysics be stated in general. I will not get into the details here, but I also consider the methodological or metametaphysical commitments we make as part of the toolkit.

Lastly, the methodology and way in which we receive evidence for metaphysical theorizing ought to be included in the toolkit of knowledge. Quine thought that metaphysics was essentially compiling a list of all that existed, understood as those entities quantified over by scientific theories.[32] Since Quine's time, philosophers have developed more nuanced approaches to building ontology on the basis of science. The various interpretations of quantum mechanics make many metaphysical posits beyond those entities quantified over by formal quantum theory. For example, Bohmian mechanics posits discrete particles whose positions cannot be known, and Many Worlds theorists believe in the existence of various branches of causally distinct but nomologically equivalent worlds where nearly infinite copies of human individuals exist. Each interpretation and their posits is pitched as the best explanation of the empirical data, and the methodology employed in this case, that of theoretical virtue balancing and inference to the best explanation, is more complex than merely compiling a list of entities quantified over by our scientific theories.

I've explicated the "toolkit of metaphysics" to include first order concepts and relations included directly in metaphysical theories, metametaphysical considerations of how our theories should be structured, and lastly, considerations beyond the content of our theories, like the method by which we take scientific evidence to provide support for ontological claims.

[31] See Russell (1927).
[32] See Quine (1948).

4.2 Insights Gained from False Theories

As established, metaphysical theories are capable of becoming more truthlike over theory change. The problem remains that it is not obviously valuable to theorize about metaphysics before we have the final physical theory. This is true because the final metaphysical theory may be very different than our current theory. The value, I contend, in doing metaphysics along the way to the final theory is that we develop our metaphysical toolkit in a way that will be useful for the final metaphysical theory.

Recall the example of shifting from Humeanism to OSR. I'm taking Humeanism to be the thesis that there is a fundamental mosaic of perfectly natural and intrinsic properties of spacetime points or objects and spaciotemporal relations between the points or objects. The claim that there is this fundamental mosaic also comes with the claim that everything else that exists supervenes on the mosaic. So, a Humean must explain how it is that everything can supervene on a fundamental mosaic. One central challenge of establishing the supervenience thesis for Lewis was reducing nomic properties, expressed by the laws of nature, to the mosaic. For this, Lewis made the distinction between simple and strong truths where strong truths reflect something deep about the world and simple truths are uncomplex, like "this chair is brown". Lewis thought that laws of nature are generalized collections of strong and simple truths, like Newtonian's laws of nature, for example. There were many challenges for Lewis, such as how to make sense of simplicity and non-deterministic laws. The point for our purposes is the fact that Lewis provided a system where the laws of nature could be reduced to the Humean mosaic as the best system of those local matters of fact. Indeed, Lewis's theory served as an example of a unified model for how higher order facts, objects, and laws could supervene on the mosaic.

Now compare Humeanism with OSR. The OSRist tries to make sense of how the structure underwriting the laws can be the basis for objects (macro-objects and particles if one holds a non-eliminativist version of OSR). Most commonly, one makes sense of the claim that structure is ontologically prior to objects by using a dependence relation instead of a supervenience relation.[33] So, changing theories from Humeanism to OSR reflects the following shifts in belief: relations are fundamental and intrinsic properties are not fun-

[33]There is some dispute on this. McKenzie (2014) argues that the relation between objects and structure should be dependence. Wolff (2012) argues that the relation ought to be supervenience. Most commentators think that supervenience is insufficient, however.

damental and higher-level objects relate to the fundamental level by determination or dependence instead of supervenience. Despite these differences, Lewis' unified account of the way higher level facts are based on lower-level facts provided the framework for how to even make sense of a metaphysical thesis like OSR. Again, that's not to say that Humeanism is approximately OSR, but rather that Lewis' theorizing established metaphysical tools to understand subsequent theses like OSR. The unique challenge for the OSRist is to show how the identity of objects can depend on structure, and subsequently how everything else depends on that fundamental structure. Lewis' account established how macro-objects and properties may depend or reduce to the fundamental facts and though incompatible with OSR, it provided the necessary tools to make OSR a coherent thesis.

So far, I've noted the tools gained from Lewisian Humeanism that proved to be useful for OSR. The work in developing OSR has also given rise to various novel metaphysical tools. I'll remark on a few insights gained from the analysis of OSR.

One metaphysical insight gained is the analysis of individuality. The argument from permutation invariance in quantum mechanics utilizes Leibniz' principle of the identity of indiscernibles to show that distinct quantum particles are in fact not individuals as commonly understood.[34] Simon Saunders, following a concept of "weak discernibility" from Quine, argues that each fermion in an entangled singlet state has a property with the other fermion that is irreflexive, meaning that the property does not apply to themselves. Specifically, each fermion has the property of opposite spin to the other, but each fermion cannot have the property of opposite spin to itself. Thus, Saunders holds that simultaneously each particle must be numerically distinct and dependent on the qualitative relations with the other fermion. This nuanced notion of individuation is gained from the analysis of OSR.

Generalism is another novel metaphysical account developed by Dasgupta that was not inspired specifically by the arguments for OSR but by similar considerations of empirically identical worlds.[35] Generalism allows for the logical relations or qualitative facts between objects to be logically prior to the individual facts. Individualism, as opposed to generalism, holds that there are objects with properties like Fa, Gb, and a relation between the

[34]See Saunders (2003) for an explanation of Leibniz' principles.

[35]See Dasgupta (2009).

objects Rab.[36] Generalism holds instead that the relevant quantified expressions are fundamental, like $\exists x Fx, \exists y Gy, \exists x \exists y Rxy$. The details are not important to understand. What's important is that a new metaphysical model that emphasized the qualitative structure of objects, as opposed to intrinsic properties, was developed from scientific considerations similar to those motivating OSR.

These developments of novel metaphysical tools are just a few that have arisen from the analysis of ontic structural realism, though I'm sure there are more.

The second example is the shift from type identity theory to functionalism in the philosophy of mind. Type identity theory has its roots in Place and Smart.[37] Type identity theory holds that sensations are identical to brain processes. For example, pain just is the firing of c-fibers. The central challenge for type identity theory was to explain the apparent differences between sensations (phenomenal experiences) and brain states, such as the fact that we learn about the existence of each through very different means and they seem to each have properties that the other could not have. These facts motivated many to think 'sensation' and 'brain process' have different meanings and thus could not denote identical phenomena. Place and Smart responded to this challenge by emphasizing that we can have two terms with different meanings which have the exact same referent and thus be identical. For example, "lightning" and "motion of electric charges" might have different meanings, but that does not mean lighting is anything over and above the motion of electric charges.[38]

The argument from multiple realizability is historically thought to be a defeating objection to type identity theory.[39] The argument makes use of the fact that phenomenal sensations, like pain, can be realized by various physical states. Pain may be realized by c-fibers in humans, but perhaps pain is realized by z-fibers in zebras. Nevertheless, the type "pain" is the same in each being. Thus, the argument concludes, sensations cannot be identical to physical state types. Functionalists think that mental kinds, like pain, have a particular causal role that is realized by a physical brain state. That causal role may stay the same across different instantiations (tokens) of

[36] I borrow Glick (2020)'s explanation of generalism.

[37] See Smart (1959) and Place and Smart (1954).

[38] This example and synopsis of the debate is taken from Smart (2000).

[39] For the initial introduction of the argument in the philosophy of mind see Putnam et al. (1976).

pain, in other beings for example, but the physical process that realizes the causal role may vary. Thus, functionalism is thought to sufficiently account for multiple realizability.

Now let's say that both type identity theory and functionalism are strictly false. It is still true that the analysis surrounding the development of each view expanded our metaphysical toolkit by clarifying our concepts regarding identity and realization. One insight gained from developing type identity theory is that one entity can be identical to another entity even if the terms used to refer to each entity express different meanings. The concept of a brain state seems different than a mental state in that a mental state can seem like it has the property of being green, while a brain state cannot be green. Place and Smart responded to this worry by emphasizing that there can be multiple terms with different meanings while having the same referent, like the terms "morning star" and "evening star" both referring to Venus.[40] This insight clarifies our concept of identity—we may have different ways of knowing about the same entity and attribute different terms with different meanings to one entity.

Lastly, identity theorists applied the concepts of type and token from the philosophy of language to metaphysics. The notion of tokens and types was largely used in language, such as the token word "beauty" that can be displayed multiple times on a page, e.g. "beauty, beauty, beauty", and the type "beauty" which is only displayed once on this page. Many identity theorists shifted from assenting to the type identity of mental states and brain states to the token identity of mental states and brain states. They held that a given token state of pain is identical to the token brain state of c-fibers firing, but the general type pain is non-identical to the physical state. This dialectic deepened our metaphysical understanding of token and type.

4.3 Thinking Back to Progress

So how does this all fit in with progress? Remember, in elucidating the metaphysical insights and developments to our toolkit is not to suggest that the theories that gave rise to these models, new concepts, and all other knowledge are valuable because they are continuous with the final true theory (i.e. are approximately true). The fact that metaphysical theories are discontinuous with each other is the challenge this section is meant to respond to. The

[40] See Frege (1892).

question under examination is: Why is it valuable to develop naturalistic metaphysical theories before having the final physical theory?

My answer is that the metaphysical toolkit we develop along the way to the final true physical theory will likely be useful for developing the metaphysical account based on the true physical theory. If there is a final true physical theory and thus final true metaphysical theory (as I've been assuming), it's plausible it will involve a complex metaphysical framework. Indeed, our best metaphysics of science seems to be getting more complex over theory change. Causation was thought to be a simple notion like counterfactual causation, but physics of the last 100 years pushed many to think that causation does not exist in physics given the temporal symmetry of deterministic dynamics.[41] More recently, many think causation exists but is defined by a more subtle notion of intervention and may apply differently across special sciences.[42] In order to account for what is likely a very complex final physical theory, we will need a large set of metaphysical tools to interpret it correctly.[43] Without the token type distinction, identity theorists would not have the resources to develop token identity theory. Without Leibniz' principle of identity of indiscernibles, OSRists would not be able to make the case that quantum particles are non-individuals. Perhaps the best example of this is possible world semantics, since it's proved to be useful for making sense of various ideas beyond modal realism.[44] It is likely that we will have to deploy all kinds of metaphysical tools that we have developed over the course of the history of metaphysics in order to make sense of the final physical theory, whatever it may be.

One may point out, however, that it is implausible that we'll need every metaphysical concept, model, methodology, and any other tool for the final theory. We may not need most of what we have learned. This does not mean that the unused metaphysical knowledge we have gained along the way to the final theory is useless. The reason for this is the crucial fact that we do not know what the final physical theory will be. Our final theory may be deterministic or indeterministic, it may posit determinate or indeterminate

[41] See Russell (1912).

[42] See Woodward (2003) for the interventionist account of causation.

[43] There are likely different ways of thinking of complexity in this context. For now, I mean a general notion of coarse grain to fine grain concepts. For instance, hyperintensional notions like ground are more complex than necessary equivalence, since two propositions, x and y, can be true in all the same possible worlds but it may be false that x grounds y.

[44] For example, possible worlds were instrumental in developing modal logic.

states, it may say that structure is fundamental or intrinsic properties of objects are fundamental. We may have a gunky would with infinite proper parts or metaphysical atomism. It may be that 4d space is derivative on a more fundamental configuration space or it may be that 4d space is fundamental. The very point of McKenzie's worry is that we really do not know what metaphysical theory the final physical theory will support, which is why developing our toolkit as much as possible is useful before we have the final physical theory.[45]

4.4 An Objection: Why Not Develop the Toolkit with *A Priori* Metaphysics?

Before I conclude, I want to respond to the potential objection that doing naturalistic metaphysics, as opposed to armchair *a priori* metaphysics, is unnecessary for the account of progress I have put forth. Along the lines of McKenzie and French's toolkit approach (French and McKenzie (2012)), the value of metaphysics is developing various tools with which the philosopher of physics might apply to physical theory at some point. This approach makes the value of metaphysics analogous to the value of math for understanding the world. Here the idea is that mathematical systems are developed abstractly but may be applied to physical theory and thus may help in discovering the way the world actually is—e.g. the use of non-Euclidean geometry for General Relativity. Following this view, metaphysicians can theorize purely abstractly and from the armchair, which would allow them to develop metaphysical tools that can be applied to physical theories. Thus, since current naturalistic metaphysical theories are false, there is not value in doing naturalistic metaphysics until we have the final theory.

My response to this is the following. Insights from science inform us more appropriately and beyond what we can imagine from abstract *a priori* theorizing. In other words, the metaphysical knowledge we gain from science is more likely to be relevant to the final naturalistic metaphysics than the

[45]One might think the view of metaphysical progress I have put forth is deflationary and weak sense of progress. One might say: "So the only use for metaphysics is if the metaphysical knowledge we gain by theorizing is used in a final theory, which it very possibly may not be used in?". The answer to this question is yes but remember that I have restricted the account of progress to bettering our *a posteriori* knowledge of the world. So, it's still open that it is useful and worthwhile to develop *a priori* metaphysical knowledge, even if it is not applied to our best science.

knowledge we gain from scientifically detached metaphysics. The various insights gained about dependence and structure from the debate on OSR already mentioned would be a prime example of this. Another good example would be the metaphysical developments made in light of Everettian quantum mechanics. Metaphysicians who try to provide a consistent metaphysical backdrop to many worlds have developed novel views on persistence, law fundamentality, chance, among other concepts. Interventionism about causation was supported by causation in the special sciences. These are just a few examples, but there are surely more. Science is often the starting point or provides the data for novel and interesting metaphysical theorizing, the kind of ideas that we would likely not discover by *a priori* theorizing alone.[46]

One might point out that this view is not very different from French and McKenzie's. After all, they make the case that physics is the proper jumping off point for questions about modality and that science can inform our metaphysics even if metaphysics has a different subject matter (this example focuses on modality).[47] Their view is similar to mine, but the difference is that their view is about the value of metaphysics synchronically and my view is about progress, which is a diachronic concept. French and McKenzie emphasize that there is value in *a priori* metaphysical theorizing by developing abstract tools, but also that we should look to science in order to learn about metaphysical notions like modality. Their account does not, however, solve McKenzie's problem that the metaphysics we develop based on current scientific theory is likely false and thus there seems to be no value in naturalistic metaphysics before the final physical theory. My account does solve the problem by connecting the notion of metaphysical tool development to naturalistic metaphysical theorizing about current scientific theories. Both accounts utilize the notion of metaphysical tools, but my account, properly put, is a positive account about metaphysical progress.

[46]This is not to say that only naturalistic metaphysics is valuable. Indeed, that idea does not even seem coherent. The kind of debates we have about vagueness, personal identity, causation, and so on are all metaphysical debates beyond developing metaphysical interpretations of science. They are useful for discovering truth about the world in so far as they apply to physical theory, but the way we develop the tools primarily happens by objection and response in a non-empirical debate between metaphysicians.

[47]See French and McKenzie (2012) section 4.

5 Conclusion

In this paper, I explained McKenzie's view that naturalistic metaphysics cannot make progress. She argues that metaphysical theories cannot make progress because they cannot approximate each other and thus they cannot approximate the truth. I then objected to her view in a twofold way. First, I suggested that metaphysical theories can make progress on the truthlikeness account of progress. I noted however, that this would not satisfy McKenzie since it seems like we do not meaningfully know about the world before the final metaphysical theory because the final metaphysical theory may be very different from our current theory. For this remaining worry, I motivated a novel account of the value of developing metaphysical theories in terms of the metaphysical tools we develop along the way to the final theory. Thus, there is great value, in terms of truth, in naturalistic metaphysics before the final physical theory.

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