

# Are the Questions of Metaphysics More Fundamental Than Those of Science?

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When pursued naturalistically, metaphysics may seem forced to navigate a narrow path. So that it may be a worthwhile enterprise, it must have claim to discovery of a distinctive set of objective truths. Yet it must also avoid potential competition or conflict with the results of scientific theories. In response to this problem, some naturalistic metaphysicians have argued that properly understood, metaphysics is aimed at a set of truths distinct from those of science. Metaphysicians investigate a realm of truths more fundamental than those of even fundamental science. This paper examines what is required both in science and metaphysics for a theory to count as a fundamental theory. Several criteria are presented which suggest that metaphysics does not investigate a realm more fundamental than that of science.

The project of naturalized metaphysics appears straightforward. Start with one's best scientific theories and infer one's metaphysical commitments from what these theories say exist, the sort of ideological frameworks they employ. Yet, as many have noted, naturalism poses challenges for metaphysics as it is typically practiced. In particular, once scientific theories themselves offer verdicts about the sort of things that exist, the properties they have, and the spatiotemporal structures they occupy, what more is there for metaphysicians to contribute than simply repeating what is already known? Even if the work is straightforward, in becoming naturalized, metaphysics seems to promote its own obsolescence.

The goal of this paper is to evaluate one influential response to this concern, one that has been appealing to many contemporary metaphysicians who are naturalists. This is to argue that although it might appear that metaphysics and science are aimed at a common set of questions about the sorts of entities the world contains and what they are like, this appearance is misleading. Metaphysicians rather address a distinctive subject matter, a subject matter more fundamental than that of science.

For example, L.A. Paul, addressing this apparent tension between projects in metaphysics and science, has claimed:

Despite initial appearances to the contrary, the different approaches [science and ontology] are not in tension, for the ontological account involves features of the world that are metaphysically prior to those of the scientific account. The ontological account describes the metaphysically prior categories and constituents of the physically fundamental entities, and in this sense describes features of the world that are more fundamental than those of natural science. (2012a, p. 5)

E.J. Lowe puts his proposal this way:

The time has now come for me to offer my own answer to the question of whether, and if so how, metaphysics is possible. My view is that it is indeed possible: that is, I hold that it is possible to achieve reasonable answers to questions concerning the fundamental structure of reality – questions more fundamental than any that can be competently addressed by empirical science. (1998, pp. 8-9)

And Cian Dorr calls this a “traditional” view about the subject matter of metaphysics:

[A] self-proclaimedly “scientific” view of the supremacy of the sciences among forms of human inquiry makes it *prima facie* puzzling how there could be room for a field called ‘metaphysics’ that is not itself a science and is nevertheless not a waste of time. One traditional picture imagines metaphysics as standing to physics as physics stands to biology – investigating a proprietary realm of facts that cannot even be expressed in the vocabulary of physics, and that provide “foundations” for physics in the same sense in which physics provides foundations for biology. (2010)

I agree with Dorr that this is a traditional view about the relationship between metaphysics and the sciences, one that can arguably be traced to Plato and Aristotle, Leibniz and Kant. My question is whether this is a view that is tenable in the context of the naturalistic approach to metaphysics many favor today.

Part of the difficulty in evaluating this view stems from obscurity in the meaning of ‘fundamental’. Dorr provides some guidance when he claims that it is the same sense of fundamentality appealed to when it is claimed that the sciences stand in relationships of relative ontological priority or fundamentality, with physics at the bottom of the hierarchy. There are many senses of ‘fundamental’ used by physicists and philosophers of science who make the claim that physics is more fundamental than the other sciences. Several of these senses overlap with the notions of fundamentality deployed by metaphysicians. I will argue that it would not be reasonable for most naturalistic metaphysicians to claim that the questions of metaphysics are more fundamental than those of science in any of these senses. I say ‘most naturalistic metaphysicians’ because, as we will see, there are some controversial positions that a metaphysician might take on in order to defend the view that metaphysics is more fundamental than science in one or another of these senses.

Before we begin, I should emphasize that the question with which I am concerned in this paper is whether metaphysics may be more fundamental than science in some metaphysical sense of ‘fundamental.’ The question is not one (or not directly one) of relative importance. We do often use the word ‘fundamental’ in ordinary language to mean important, but the philosophers I will discuss are careful to distinguish a claim of metaphysical fundamentality from one of importance.<sup>1</sup>

The question is also not one of epistemological priority. One might have the view that even to begin to determine what precisely science or perception suggests about the world, we must be sure that there is a world beyond our minds; we must rule out the various skeptical scenarios and defend realism about the external world. In this way, one might

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<sup>1</sup> Below, I will discuss how a claim of metaphysical fundamentality may be used to support a claim of relative importance. However, that fundamental theories are important theories is not generally interpreted (by philosophers or by scientists) to be an analytic claim.

view metaphysics as epistemologically prior to science because it comprises a set of problems that must be addressed before we can understand the kind of world science reveals (a perceptible external world, or a world of ideas in God's mind, or a world of Platonic Forms). Perhaps metaphysics is an epistemologically prior "first philosophy" in this sense. But this will not be the issue that will concern us here. The question rather concerns metaphysical priority. This is particularly clear because we are considering the claim that the relationship between metaphysics and science is analogous to the relationship between physics and the other sciences. The physicalist's claim that physics is more fundamental than the other sciences does not imply that *knowledge* of the truths of physics is or should be prior to knowledge of the truths of chemistry or biology. It is hoped that our best physical theories may provide the resources to explain in virtue of what the latter truths hold, but this is a metaphysical issue, not an epistemological one.

### 1. The Obsolescence Concern for Naturalized Metaphysics

In this section, I will introduce in greater detail the critique of metaphysics that the "more fundamental subject matter" view aims to address, but before going any further, I should say something about what I mean by 'naturalized metaphysics.' This is not a sharp notion, but it is possible to make some points of clarification. Quine viewed naturalism as the attitude that "it is within science alone, and not some prior philosophy, that reality is to be identified and described" (1981, p. 21). This is clear enough, but at the same time too restrictive, for it immediately rules out contributions an a priori metaphysics may make to our understanding of the structure of the world. To be more neutral on the issue of the role of a priori methods within naturalized metaphysics (since it is debatable whether or not a priori methods may figure in a naturalized metaphysics), I will work with a looser conception of naturalism than that provided by Quine. Instead, let's conceive of naturalism as incorporating the following components: first, science makes positive contributions to our understanding of external reality, and second, philosophy should not contradict the verdicts of our best scientific theories. This is compatible with things Paul says in elaborating her position:

[T]he metaphysician should be concerned to prescriptively develop and understand the prior, deep, and general truths about the fundamental natures of the world used to organize and understand the rest of the world. Science still acts as a constraint upon metaphysics – the metaphysician should want her theory of the whole world to be consistent with accepted scientific theories of the world. (2012a, pp. 6-7)

One might also, as is traditional, incorporate into one's understanding of naturalism a rejection of "supernatural properties," i.e. "properties attributed to deities, properties allegedly experienced in mystical encounters with suprasensory reality, and transcendental properties of certain metaphysical systems" (Kim 2003, p. 95), transcendental properties being those that are not instantiated within the spatiotemporal framework of our best scientific theories.

Many naturalist metaphysicians adopt a stronger position than mere naturalism. Many are physicalists, taking the stance that among the sciences, one, physics, is best placed to provide a fundamental and approximately true characterization of the structure of our world. A physicalist thus has her metaphysics determined narrowly by what a subclass of the best scientific theories say, the best physical theories, as well as by what she believes may be constitutively explained by these theories.

We may now begin to describe the problem the holding of such physicalistic or more broadly naturalistic attitudes carries for the pursuit of metaphysical projects. If one believes that scientific theories provide approximately true characterizations of our world, inventories of the types of entities it contains and in other respects what it is like, then metaphysics runs the risk of obsolescence. Mathematics, physics, and the other sciences already provide the answers to the questions metaphysicians have taken it as their job to address. For example, as Thomas Hofweber points out, metaphysicians have long concerned themselves with questions about the existence of properties.

This question is supposed to be a large-scale philosophical question about how to understand the world of individuals and how they all relate to each other, reflecting on this world as a whole. But materials science has found out that there are some features of metals that make them more susceptible to corrosion, but more resistant to fracture. And thus what it has figured out immediately implies that there are features, i.e. properties. What is left for metaphysics to do? (2009, p. 261)

Similarly, mathematics shows there are numbers (since it shows there are prime numbers), thus undermining debates about platonism. Chemistry shows there are many situations in which two or more objects come to compose something (since it provides accounts of the circumstances in which atoms are bonded into molecules), thus settling debates over mereological nihilism. And general relativity shows us there is such a thing as spacetime and it is a real, dynamically changing entity that can have a structure independent of the existence of any objects existing within it, thus resolving debates about spacetime substantivalism.<sup>2</sup> And so on.

And as James Ladyman, Don Ross, and David Spurrett (2007) have argued, it is not just that science does a very good job of already answering the questions that metaphysicians have posed, it also gives us reason to be skeptical that philosophy is equipped to provide justified answers to these questions in the first place. Although physics and the other sciences have proven to be very successful, developing theories that make precise, novel predictions and perfecting techniques allowing these predictions to be confirmed, metaphysics, using a priori methods of intuition and thought experiment, perhaps supplemented with inference to the best explanation, is on a much more problematic footing. For evolutionary theory reveals that we did not evolve to form reliable beliefs about the topics metaphysics concerns itself with. Ladyman et. al. write:

Proficiency in inferring the large-scale and small-scale structure of our immediate environment, or any features of parts of the universe distant from our ancestral stomping grounds, was of no relevance to our ancestors' reproductive fitness. Hence there is no reason to imagine that our habitual intuitions and inferential responses are well designed for science or for metaphysics. (Ladyman et. al. 2007, p. 2)

So, if one is a naturalist, one should think that the only path to justified belief about general features of the world involves use of the distinctive methods of science, not those

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<sup>2</sup> Does general relativity provide this answer? That is a question of the interpretation of physics, a question for philosophy of science, not metaphysics. Critics of metaphysics generally tend to think there is a lot of useful work for philosophers to do, this just isn't work in metaphysics (see e.g. van Fraassen 2002, Chapter 1).

methods used by metaphysicians: intuition, thought experiment, or inference to the best explanation.

If metaphysicians were addressing the same issues as the sciences, only using less successful methods, then one might reasonably be drawn to the conclusions offered by Hofweber, Ladyman et. al., and van Fraassen: that metaphysics (at least metaphysics as we know it) should be discontinued. However, one may question whether metaphysicians really are addressing these same questions that appear resolved by scientific theories, or at least adequately addressed by them. And if metaphysics instead has a distinctive set of questions, one might ask whether the methods of science are themselves adequate to addressing the topics in which metaphysicians are especially interested. As we've seen above, several metaphysicians have suggested that metaphysics addresses a subject matter more fundamental than that addressed by any actual scientific theory, perhaps more fundamental than may be addressed by any possible scientific theory.

## 2. The Subject Matter of Metaphysics

So what are these distinctive questions of metaphysics, these questions that are supposed to be more fundamental than any questions of science? How these questions are conceived varies from one metaphysician to another. However, we may look at the proposals sketched by Lowe and Paul to see some examples.

Metaphysics and physics, according to Lowe, both address “the nature of things existing in space and time, . . . the nature of space and time themselves, and . . . the nature of causation” (2002, p. 2), although physics, unlike metaphysics, makes discoveries and tests its claims using experimental and observational data. If this were all there was to be said about the subject matter of metaphysics, then the threat of obsolescence would arise. However, Lowe argues that this is not all that metaphysics concerns itself with. Metaphysics also takes on questions that no individual science can address: it is concerned with “the fundamental structure of reality as a whole” (2002, p. 3). Questions about the fundamental structure of reality as a whole concern *inter alia*, questions about the relationship between the subject matters of the various sciences, and also questions about the fundamental categories of entities that must exist. In a 2013 interview, Lowe clarified:

In pursuing its task, metaphysics must take notice of developments in theoretical science, but should not be in servitude to them. . . In my view, metaphysics, with ontology at its heart, is an autonomous and fundamental mode of inquiry, beholden neither to the empirical sciences nor to the a priori sciences of logic and mathematics. It really is, as Aristotle said, ‘first philosophy’, and as such an implicit pre-requisite for any more specific form of intellectual inquiry whatever. In that sense, I am not a ‘naturalistic’ metaphysician. But my kind of metaphysics is far from being ‘dull’, I would venture to say. It seeks to articulate a coherent system of ontological categories and a consistent account of the fundamental formal relations obtaining between entities belonging to these categories, in terms of which we may hope to understand the fundamental structure of reality as a whole.

These questions are different from the questions of science because, Lowe appears to think, they are questions that require methods beyond those of science. It is not clear to me that it is possible to make as sharp a distinction as Lowe wants to between the methods of science and the methods of metaphysics. Scientific theorists do certainly strive to “articulate a coherent system of ontological categories and a consistent account of the

fundamental formal relations obtaining between entities belonging to these categories.” One need only think of the architects of the periodic table or the Standard Model of particle physics.

But supposing there is a distinctive set of methods we can attribute to metaphysicians as opposed to scientists, it is still not clear why in virtue of using these methods, this should entail that metaphysics is more fundamental than the sciences in any metaphysical sense. In the above passage, as opposed to that quoted earlier, Lowe first makes a claim of epistemological priority for the questions of metaphysics. Perhaps the distinctive accessibility of metaphysical methods can support some claim of epistemological priority. However, the last sentence in the above passage states that the questions of metaphysics have a metaphysical priority as well, and this is the claim we are here concerned with.<sup>3</sup> In his book, *The Four-Category Ontology: A Metaphysical Foundation for Natural Science*, Lowe argues that the fundamental categories are objects, kinds, property-universals, and modes, and views the Four-Category Ontology as metaphysically more fundamental than the ontologies provided by the various sciences. We should ask in what sense of ‘fundamental’ the Four-Category Ontology is supposed to be more fundamental, according to Lowe. This will be addressed shortly.

Unlike Lowe, Paul argues that the methods of metaphysics do not differ from those of science. So it cannot be any difference in methodology that justifies a difference in subject matter. Rather, Paul believes there are certain types of questions that metaphysicians address that are by the nature of their subject matter more fundamental than any questions of science.

What divides the topics of metaphysics from those of science is that metaphysicians seek to determine what Paul calls ‘fundamental natures,’ whereas science fills in the things and properties in the world that possess these natures. Like Lowe, Paul ascribes a central role in metaphysics to the discerning of the most basic categories of entities, which may include objects, properties, spatiotemporal structures, and laws of nature. (Paul 2012a, p. 4, 2012b, p. 233). Metaphysics tells us what the fundamental categories are and tells us their natures, what it is to be a property or what it is to be a law of nature. And then physics and the other sciences may tell us which things there are that have these natures: which individuals, properties, structures, or laws of nature there actually are. Thus, metaphysics concerns itself with the “prior, deep, and general truths” about the fundamental natures of the world (2012a, p. 6).

In addition to telling us about the natures of the fundamental kinds of entities and structures, metaphysics also, according to Paul, tells us how the fundamental constituents of things may combine to create other structures, including those that are presented in perceptual experience. Paul explains:

[The] scientist may tell us that the constituents of a cell are certain molecules and bonds arranged in a particular way, while the metaphysician may tell us that these constituents arranged in this way make the cell in virtue of *composing* the cell, that is, they tell us what it *is* for the molecules and bonds to be constituents of the cell. (2012b, pp. 232-233)

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<sup>3</sup> Throughout, I use ‘fundamentality’ and ‘priority’ nearly interchangeably. The main distinction is some would think talk of ‘fundamentality’ implies the existence of a unique fundamental level. For the purposes of this paper, I will not make any such assumption.

So it appears, while science may tell us which things compose which other things, as well as discovering the causal processes, interparticle interactions, and external influences that make it the case that we have a composite object, metaphysics describes the nature of the constitutive relationship between the parts and wholes. In this way, Paul considers metaphysical theories of composition “more fundamental and more general” than any physical or chemical theory. But again we can ask, in what sense are these metaphysical issues more fundamental? Again, we will need to examine notions of fundamentality to see in what sense, and whether, this is so.

In summary, we have seen four types of issues that metaphysicians address that are claimed to be different from and more fundamental than questions addressed by science: (a) what are the fundamental ontological categories (or more broadly metaphysical categories), (b) what are these categories’ natures, (c) what is the nature of constitutive relationships, and (d) what is the relationship between the sciences.

### 3. Independence from Scientific Results

So far we have not said enough to either justify or reject the claim that the metaphysician’s questions are more fundamental than those questions addressed by science. There may be something intuitive about the idea that an investigation into the natures of things is an investigation into a particularly fundamental subject matter, but in what sense this is so or what is to be said about the other topics addressed by metaphysicians remains to be seen. One might begin to argue for the relative fundamentality of these questions of metaphysics by claiming that their answers are independent of any actual scientific results. Let’s explore this line of reasoning.<sup>4</sup> We may start by considering one particularly abstract metaphysical issue: that of the nature and reality of properties.

When philosophers debate the reality of properties, they often set aside the question of what actual properties there are as determined by science or work with hypothetical cases, because it is assumed that the scientific facts simply have no bearing on the arguments on either side of the metaphysical issue. Consider a general form of the One Over Many, one canonical argument for the existence of universals:

#### The One Over Many

1. There is some  $x$  that is  $F$  and some  $y$  that is  $F$ , where  $x \neq y$ .  
Therefore,
2. There is a universal,  $F$ -ness, that  $x$  and  $y$  both instantiate.

Although scientific work may help us to run instances of this argument by showing us examples of the kinds of entities there are and the similarities they have, this work is irrelevant to determining the question of whether the One Over Many provides a compelling defense of realism, i.e. whether it is in fact reasonable to infer from cases of similarity to the reality of entities that explain those similarities.

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<sup>4</sup> I am not claiming that this is a way Paul would want to argue for the relative fundamentality of metaphysics as she has argued (2012a especially) that consideration of scientific results is important to determining what metaphysical categories are basic. But it is in line with the way many metaphysicians have conceived their projects, including Lowe.



Or, one might consider Peter van Inwagen's Special Composition Question (the question of in which circumstances it is true for some things that there is a thing they compose) and the kinds of arguments that motivate metaphysicians to adopt one or another answer to that question. One common answer to the Special Composition Question, that composition is unrestricted, was defended by David Lewis (1986). When Lewis said composition is unrestricted, he meant that any entities that do not overlap spatially will in any circumstances whatsoever compose some entity, however far apart they may be. His argument for unrestricted composition may be paraphrased in the following way:

#### The Argument from Vagueness

1. Any restriction on composition (e.g. a restriction to circumstances in which the entities are in contact with one another or bonded or function as a living organism, etc.) would involve vagueness, because there are always circumstances in which it is indeterminate whether the restriction condition obtains.
2. If it is vague whether composition occurs, then it is vague what exists, because then it is vague whether some composite object exists.
3. But existence is not vague. Things always either determinately exist or they determinately don't.

Therefore,

4. Composition is unrestricted.

Each of Lewis's premises and the reasoning that takes one from the premises to the conclusion seem to rely purely on a priori reasoning. Again, scientific work might teach us something about the sort of entities that exist and so what is there in the first place to potentially compose some other entities. But this is not what is debated when metaphysicians debate the Special Composition Question. Such scientific work is irrelevant to determining the validity and soundness of the above argument.<sup>5</sup>

One might try to parlay a claim of independence (of metaphysical conclusions from scientific results) into an argument for the relative fundamentality of metaphysical subject matter. But this would not succeed. The reason is that one could also just as easily argue for the independence of scientific conclusions from metaphysical results. Scientists can quite often (if not, as many would claim, always) get on with their work without learning anything about the work of metaphysicians. But if a claim of relative fundamentality followed from a claim of relative independence, then this would mean metaphysics was both more fundamental than science and science was more fundamental than metaphysics. But relative fundamentality is an asymmetric notion. So, it can't be that relative independence implies relative fundamentality. At best, relative independence might be a mark of relative fundamentality, perhaps because it is a necessary condition for relative fundamentality.

As it turns out, some philosophers of science have argued that the metaphysical issues that seem most independent from scientific results like the ones I have just discussed are not in fact so independent. So, I'd like to pause momentarily to show why I think these arguments are not so clear-cut. In case independence is a necessary condition for relative

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<sup>5</sup> Note: the issue I am considering here is the independence of at least some metaphysical conclusions/arguments from scientific results. It would be hopeless to try to argue all are so independent. But perhaps for these that are, it is reasonable to argue that they are the questions of metaphysics that are more fundamental than those of science.



fundamentality, there are no clear arguments that such independence fails and so no immediate threat to the fundamentality of metaphysics.

Interesting discussions have been had, for example, about universals. Tim Maudlin (2007) has argued that because of the nature of the physical theories (gauge theories) used to represent fundamental physical features like electric charge and quark color, it is wrong to think of them as universals. This is because it is wrong to think there are absolute facts about the similarity of charges at multiple spatial locations. If what Maudlin argues about charge were true in the case of all features whatsoever, then this would undermine the case for universals by undermining the soundness of all instances of the One Over Many.

But I don't think this would necessarily undermine the independence of the metaphysician's project. A metaphysician could point out that a scientific discovery that there are no absolute similarities in nature would do nothing to undermine the validity of the One Over Many. So the metaphysical point it raises is independent of whatever one might learn from science: for cases of absolute similarity between distinct objects, if such there be, there must exist a universal to explain that similarity.

Ladyman (2017) has also criticized the idea that metaphysical debates can proceed independently of engagement with actual scientific results.<sup>6</sup> Focusing on the Special Composition Question, he argues that debate over this question has been confused for at least the following reasons. First, scientific accounts of material composition are always diachronic, but he notes that the answers to the Special Composition Question metaphysicians consider are synchronic. Second, Ladyman argues that ontological facts in science are scale-relative. One case on which he focuses is the relationship between quarks and water molecules. He takes it that the standard metaphysicians' view about composition is that quarks compose protons, protons compose hydrogen atoms, and then hydrogen atoms compose the H<sub>2</sub>O molecules we find in (say) our glass of water. But he claims, because of scale relativity, "there are no water molecules at the scale of quark interactions." A third criticism is that metaphysicians debating composition ignore quantum field theory. Quantum field theoretic conceptions of elementary particles are incompatible with their forming composite systems. Here the idea appears to be that, as we've seen, metaphysicians discussing composition are explicitly interested in circumstances in which entities that do not overlap spatially may compose some further entity. But if our best theories of matter, quantum field theories, take electrons and quarks to be fields rather than point particles, then as a rule they will spatially overlap, so they will never compose anything.

These points are all of them genuinely interesting, but at the same time, they do nothing to undermine the independence of metaphysicians' work on composition from scientific results. Let's take each point in turn. First, it may well be true that scientific accounts of composition are all diachronic. Biologists may describe the specific causal activity of cells leading to the creation of an organism, chemists the bonding activity between atoms as leading to the formation of a molecule. And so it can look like their accounts of the composition of an organism or molecule tend to be diachronic.<sup>7</sup> But

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<sup>6</sup> As a referee notes, Ladyman (2012) directly engages with Paul's (2012a) defense of metaphysics. However, in that work, Ladyman argues against Paul's claim that the methods of metaphysics (she describes these as involving modeling and the use of inference to the best explanation) are the same as those of science. Ladyman (2012) does not engage with the claim that metaphysics possesses a distinctive and fundamental subject matter.

<sup>7</sup> This is a point that is captured by the mechanistic approaches to reductive explanation currently popular in philosophy of science (Machamer, Darden, and Craver 2000).

Ladyman is not correct that metaphysicians have only proposed synchronic accounts of composition. Most obviously, the account van Inwagen proposes in *Material Beings* is itself a diachronic account. Most metaphysicians however think there are problems with diachronic accounts and so prefer synchronic accounts like the unrestricted composition view.<sup>8</sup> Lewis's argument, and a variation on it by Sider (2001), have convinced many that for any diachronic account of what it would take for there to be an organism or a molecule, these cells or atoms must already have composed something, otherwise there would at some point as the activity gets underway obtain the absurd situation of something's indeterminately existing. This might not yet be an organism or a molecule, but the argument is intended to show that the cells or atoms must always and so already have composed something. Ladyman's confusion, I would argue, is in thinking that what the Special Composition Question is about is when the kind of thing we would call an *organism* or a *molecule* exists, rather than when *some composite object* exists. Scientific accounts may bear on the former issue, but the latter is a separate matter and may be debated independently of scientific accounts of biological or chemical composition.

I would make similar points in response to Ladyman's criticisms from scale-relativity and quantum field theory. The metaphysician who debates the Special Composition Question is concerned with the question of in which circumstances some entities (as we've seen, she is interested particularly in things that do not overlap spatially) compose some further thing. Now Ladyman may correctly point out that in circumstances in which there is water, there are no quarks. Then it will be immediately ruled out that quarks ever compose water. However, the metaphysician can still ask in which circumstances in which there *are* some quarks (that do not overlap) do they compose *something*, some collection or composite object. Similarly, Ladyman's point about quantum field theory may lead us to say that perhaps since quarks are best understood as fields and so entities that overlap spatially, they never compose anything in the metaphysician's sense.<sup>9</sup> That is fine and doesn't undermine the metaphysician's question about composition and when it occurs among spatially non-overlapping objects. The metaphysician's question in no way presupposes that composition is a relation that extends all of the way down to the level of physics's elementary entities.

In sum, I believe that there are questions that metaphysicians are concerned with that can be addressed adequately in a way that is independent from scientific results. And so if relative independence is a necessary condition for relative fundamentality, then some questions can meet this condition. This comes about because at least some questions of metaphysics are quite abstract. Not all questions metaphysicians are interested in are so abstract and so not all metaphysical issues will benefit so well from discussion removed from scientific inquiry. But those who propose the view that the questions of metaphysics are more fundamental than those of science need not try to argue this for all metaphysical questions.

Still, what is the bearing of the abstractness and independence of some metaphysical questions on their relative fundamentality? It is not clear there is any such direct bearing. I will examine this issue in the next section by looking at the many ways in which

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<sup>8</sup> Or mereological nihilism, which for brevity I do not discuss here.

<sup>9</sup> It is worth at least flagging that this is not a consequence of quantum field theory that all philosophers of physics would accept; particle ontologies for quantum field theory are still proposed and debated. See Teller (1995) and Ruetsche (2011).

philosophers and scientists have conceived of metaphysical priority or fundamentality to see if it is reasonable for even a weakly naturalistic metaphysician (of the kind described in Section 1) to argue that the questions of metaphysics are more fundamental than those of science.

#### 4. Notions of Fundamentality

Plato held the view that what was real was fundamentally the Forms. And so philosophical inquiry into the nature of the Forms – Beauty, Justice, the Good – investigated a subject matter metaphysically prior to the subject matter of any empirical investigation. But metaphysicians today are not generally Platonists. So what can make it reasonable to think that their questions have a subject matter that is more fundamental than that of any science? That depends on the sense of ‘fundamental’ one has in mind. Recall Dorr’s characterization that metaphysics can provide “‘foundations’ for physics in the same sense in which physics provides foundations for biology.” In this section, we will consider the many ways in which philosophers and scientists have considered physics to be more fundamental than biology to see whether the questions of contemporary naturalized metaphysics can be seen to be more fundamental than those of science in any of these senses.

##### *A. The Building Block Model*

One way in which physics has often been taken to be more fundamental than biology and the other sciences is in describing the building blocks of the entities described by these other sciences. Physics is supposed to describe the little things that make up the entities of the other sciences. Indeed, one influential model of the unity of science, that offered by Hilary Putnam and Paul Oppenheim (1958), viewed all of the sciences as arranged into a hierarchy of levels with physics at the bottom, where the ordering of levels is determined by mereological relations. Entities of the sciences at each level possess a complete mereological decomposition into the entities of the sciences at the levels below.

Today, Oppenheim and Putnam’s model is widely rejected as a good representation of the relation between the various sciences. Most philosophers of science are skeptical that the sciences can be divided into a neat division of ontologies. And it is unlikely that the best way to view the relationship between entities in the subject matters of the various sciences is always one of mereological composition.

But even if the building block model were a plausible way of viewing the relationship between the sciences, it does not follow that it would be reasonable to see metaphysics as describing an even more basic category of entities out of which the entities of all of the other sciences including physics are built up. We may start by noting that this is a nonstarter as a way of arguing for the fundamentality of many of the questions metaphysicians engage. In addressing topics such as composition, causation, time, laws of nature, personal identity, and so on, the goal isn’t to delineate a basic class of entities at all. Acknowledging this, and noting again that the advocate of the “more fundamental subject matter” view need not claim *all* metaphysical questions are more fundamental, we can set these topics aside and just focus on ontological debates. However, as I will argue, the situation for the view doesn’t much improve.

Remember we are considering the status of naturalized metaphysics. I have already mentioned Plato's theory of Forms. And of course there are other revisionary comprehensive metaphysical hypotheses that involve proposals for what are the most fundamental building blocks of everything else, for example, traditional idealism and Pythagoreanism. But it is questionable whether these should be considered naturalistic in any good sense, for all seem to rely on supernatural phenomena or transcendental entities.

One might suggest that metaphysicians' debates about categories provide more plausible cases in which elementary building blocks are proposed, building blocks that are even more fundamental/basic than those of physics, and yet at the same time not in tension with a naturalistic outlook.<sup>10</sup> But this isn't the right way to conceive of the relationship between the metaphysician's posits and the physicist's. To the extent it is plausible to think of electrons and quarks as the building blocks of atoms, it is not similarly plausible to think of individuals and properties as the building blocks of electrons and quarks. Why? Because electrons and quarks *are* individuals – they are not built up out of individuals. True, metaphysicians also discuss properties. But again these aren't generally viewed as the building blocks of things physics posits – they *are* things physics posits; examples are mass and electric charge.

Perhaps one might think if one advocated a trope ontology, such as that of D.C. Williams (1953) – one took tropes to constitute the “alphabet of being” – then one would have a view according to which the entities of physics and all of the other sciences are composed of distinctively metaphysical entities, tropes. But again this isn't right, for these tropes are also entities described by science (particular masses, particular charges, and so on).

### *B. Explanatory Power / Completeness*

As I noted above, there is controversy over whether the best way to understand the relative fundamentality of the sciences is in terms of the building block model. A less contentious conception of fundamentality abstracts away from issues of composition and instead uses a notion of explanatory power. Here, the fundamentality of a theory tracks the explanatory completeness of that theory vis-à-vis a target domain. For the most fundamental physical and metaphysical theories, this target domain is the widest possible one and includes the claims of other scientific theories. And so the most fundamental of a set of theories will be the one that explains all or most of the claims of those other theories.

This understanding of relative fundamentality in terms of superior explanatory power is one that is shared among philosophers and scientists. For example, recent work on fundamentality by metaphysicians stresses the conceptual link between fundamentality and explanatory completeness. Ted Sider says, “It is natural to assume that the fundamental must be “complete”, that the fundamental must in some sense be responsible for everything.” (2011, p. 105). He argues that the best way to understand this fact is the following: any sentence formulated in the language of a nonfundamental theory must have an explanation of its truth or assertability in terms of the language of the fundamental theory. Additionally, it is common for metaphysicians who work within the grounding framework to understand the fundamental in terms of grounding explanations, explanations of what it

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<sup>10</sup> One could also consider here the ontologies entailed by the various theories of persistence. My comments in this paragraph carry over to these ontologies.

is in virtue of which something exists or obtains. It is in terms of the fundamental entities that the existence of everything else can be grounded or explained (e.g. Schaffer 2009).

Physicists too think of the relative fundamentality of their theories in terms of explanatory power. In *Dreams of a Final Theory*, Steven Weinberg defended the special character of fundamental physics partly on the basis of what such theories allow us to achieve in explanatory power. To illustrate, he argues that if we start from any fact we might want to explain, we can continue to ask a series of explanatory questions that will ultimately lead to an explanation in the terms of fundamental physics.

By tracing these arrows of explanation back toward their source, we have discovered a striking convergent pattern – perhaps the deepest thing we have yet learned about the universe. (1992)

Weinberg expresses optimism in the possibility of a final theory, one to which we can ultimately trace all arrows of explanation downward to. But this isn't an essential feature of the model. More fundamental theories may exhibit greater clusters of explanatory convergence and so, explanatory power.

There is much similarity between this conception of fundamentality and what is offered by the metaphysicians. So much so that this suggests this if anything is what we might call the orthodox conception of fundamentality.

We can now return to the claim that the questions of metaphysics are more fundamental than those of science. Interpreted in this way, the claim would be that more truths converge onto explanations in terms of the claims of metaphysics than explanations in terms of any other theory, that the ontological categories and natures described by metaphysics allow us to ultimately explain more than even what can be explained by physics, and that metaphysics can ultimately explain the truths (if not all, then at least many) of physics itself.

But this is implausible. And so I would argue that at least in this orthodox way of understanding fundamentality, it is just not plausible to think that metaphysics is more fundamental than any scientific theory. I don't think any naturalistic metaphysician would argue that a metaphysical theory could be complete in the sense of providing explanations of all other facts without supplementation with the claims of science. Moreover, today, metaphysics simply does not aspire to provide explanations of in virtue of what claims of physics are true in the way that physics seeks to provide explanations of in virtue of what claims in chemistry are true. Physics says the gravitational attraction between two bodies decreases as a function of the square of the distance between them. Which facts of metaphysics provide explanation for a claim like this? Even for those facts of physics that appear to lack physical explanations, such as the values of constants like the rest mass of the electron or the speed of light, it would be bizarre for a metaphysician to claim that these may achieve explanation in terms of a metaphysical theory. Nor have any of those authors who have claimed metaphysics is more fundamental than physics claimed that this is what metaphysicians try to do.

### *C. The Fundamental as the Unexplained, Ungrounded, or Ontologically Independent*

We have just questioned whether we may view metaphysics as more fundamental than science in the sense of being able to serve as an explanatory basis for the claims of the

sciences. But there is another way in which metaphysics could be fundamental by way of being explanatorily basic. Metaphysics might be fundamental not because of what it can explain, but because of what can't explain it. One might propose that metaphysics is more fundamental than science in virtue of the fact that the claims of metaphysics possess no more fundamental explanation in terms of the claims of physics (or any other science).

This sense of fundamental has had some uptake in physics. For example, Lee Smolin uses it to support a diagnostic for fundamental physical theories: that they should not leave anything unexplained, nor should they possess any more fundamental explanation in terms of other theories. For Smolin, the fundamental physical theory should possess the status of self-explained explainer. Smolin (2006) criticizes string theories for presupposing a background spacetime that is left unexplained by the theory, and Smolin (2013) proposes a metaphysics in which the fundamental physical ontology explains itself.

Although proposals of this kind are rare in physics, the idea that the fundamental is what cannot be explained in any other terms is much more commonly embraced in metaphysics. Metaphysicians often view the fundamental as what is ontologically independent or metaphysically unexplained or ungrounded (Barnes 2012, Bennett 2017, Schaffer 2009, Wilson 2014).<sup>11</sup> I think there is something to be said for the claim that certain truths of metaphysics are unexplained in terms of more basic scientific truths.<sup>12</sup> Indeed, this is part of what the previous section (on independence) was intended to show. But as was noted there, it doesn't follow from a claim of independence or explanatory atomism that one set of truths is any more fundamental than another set of truths. For just as some truths of metaphysics may possess no scientific explanation, some truths of science may possess no metaphysical explanation. So, if relative independence of this kind were sufficient for relative fundamentality, then it would follow both that metaphysics was more fundamental than science and that science was more fundamental than metaphysics. But relative fundamentality is an asymmetric notion. So, the status of some metaphysical truths as independent from or unexplained in terms of any scientific truths cannot serve to underwrite a sense in which metaphysics is more fundamental than science.

#### *D. Generality*

So, let's try another way of understanding the claim that metaphysics is more fundamental than science, one that might be more plausible. We've seen that we are trying to capture a relationship between metaphysics and the rest of science on the model of the kind of relationship physics bears to "less fundamental" theories like biology or economics. One familiar claim about the latter relationship is that physics is a general science, whereas biology, economics, and the rest are only special sciences. This is a claim about these sciences' domains. Whereas biology only aims to describe living systems and

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<sup>11</sup> I don't mean to suggest such a view is uncontested, just that it is common. Fine (2001) allows for the possibility of truths that are real (fundamental) but grounded. Ney (2016) uses the concept of the fundamental but grounded to formulate a solution to the mind-body problem.

<sup>12</sup> Given what was argued at the end of 4.A, I am more skeptical of the claim that a naturalist or physicalist should believe in any distinctively metaphysical entities such that these may be viewed as ontologically independent.



economics financial systems, physics aims to describe all systems.<sup>13</sup> In this sense then, metaphysics would be more fundamental than any science including physics in encompassing a broader domain of entities than any of the sciences.

I have two primary concerns with this proposal. The first is that it will be implausible to many naturalists that there is any domain broader than the domain of the sciences. What there is is what is described by the sciences. There are no further super-scientific entities. Now there is a response one might try. For metaphysicians frequently remark when describing their subject matter that although the sciences are concerned only with what is actually case, or what can happen that is compatible with the actual laws of nature, metaphysicians are concerned too with what is merely possible, including what may be only logically possible and incompatible with actual scientific laws. But note that this doesn't correspond to a broader domain. For there aren't in addition to the actual entities that exist, also any merely possible entities for metaphysics (though not the sciences) to be about. One would have to adopt the modal realism of David Lewis (1986) to think otherwise.

Now, one could shift how one thinks of generality. Although traditionally what it is to think of physics as a general vs. a special science has to do with its domain of quantification, one could instead think of generality in terms of modal strength. A metaphysically necessary truth is more general in that it applies in more actual and counterfactual scenarios than any scientific necessity. I believe this is a natural way of understanding Paul's claims as well as Lowe's about the status of the Four-Category Ontology. The metaphysical facts about the basic ontological categories, composition, causation, and so on hold in all circumstances, even where the fundamental physics is different. Here again we have to be careful: if we are not modal realists, then we won't believe there are any of these counterfactual scenarios. Rather, what we are endorsing here are conditionals of the form, "If such and such counterfactual situation were to obtain, then so and so would be the case." A couple of issues arise for this interpretation.

The first is that it is somewhat controversial whether there is a kind of necessity broader than scientific (or natural) necessity. This has been questioned by many naturalist metaphysicians (Swayer 1982, Shoemaker 1998, Ellis 2001) and so it is not a way of understanding the claim that metaphysics is more fundamental than science that will be appealing to all. In addition, we may question whether this sort of generality even correctly describes the relationship of physics to the other sciences. Here, the answer is unclear and more controversial than the domain interpretation of the generality of physics. It is not clear why there couldn't be financial systems operating according to the laws of supply and demand, or biological systems whose populations dynamically evolve according to the Lotka-Volterra equations, although the underlying physics was very different (Lange 2002). The laws of the special sciences may be realizable in very different physics. And if this is the case, then the physical necessities wouldn't be modally stronger than the biological and economic ones. So, this is to say that this way of motivating the claim that metaphysics is more fundamental than science probably won't be a way of saying it is more fundamental than science in the way that physics is more fundamental than biology.

This relates to my second main concern with this proposal, namely that I do not believe that the generality of a theory is at all a way in which a theory may be

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<sup>13</sup> This is controversial among philosophers of science (see especially Cartwright 1999), but it is a familiar enough claim.



fundamental (or relatively fundamental). The generality of a theory and the fundamentality of a theory are rather two separate features. To see this, think of two maximally general theories one might offer.

Theory 1: Everything in every circumstance has moral value.

Theory 2: Everything in every circumstance has financial value.

One could propose either theory and intend it to refer to everything whatsoever from the tiniest neutrino to the largest galaxy cluster. And yet, I think it is clear, one need not think either of these is a fundamental theory. For one might go on to explain that the moral value of everything in every circumstance lies in the fact that it is created by God and that theology is the fundamental theory that explains this fact. Or one may go on to explain that the financial value of everything in every circumstance lies in another set of facts about what it is reasonable to sell something for and that everything in every circumstance can be sold. And that this in turn may be explained by the facts of psychology and so on. So that a theory is fully general does not imply anything about its relative fundamentality.

To conclude this subsection, I think that there is a way, if one wants to adopt some of the views mentioned above, to say that metaphysics is more general than any of the sciences. Being careful to note that this is a sense of ‘general’ different from the way in which physics is more general than biology, one could adopt modal realism, or argue for a sense of metaphysical necessity broader than that of natural necessity. However, if one wants to argue in either of these ways, then one should simply say that metaphysics is more general than the other sciences, not that it is more fundamental than the other sciences, because generality is not fundamentality.

#### *E. The Nature of Fundamentality as Fundamental Subject Matter*

Finally, one might argue that metaphysics is fundamental because it studies fundamentality itself.<sup>14</sup> Because physicists qua physicists rarely if ever study the nature of fundamentality,<sup>15</sup> this is not a way in which metaphysics may be taken to be fundamental in the same sense as physics is often thought to be fundamental. But still we may consider this proposal a *sui generis* form of fundamentality that may be possessed by metaphysics alone.

As fundamentality and the conceptual tools used to make sense of fundamentality (structure, the real, grounding, and so on) are typically claimed to themselves be fundamental (Sider (2011), Fine (2001), Schaffer (2009)), one might say that questions about the nature of fundamentality are fundamental, since they concern a fundamental subject matter. Suppose one accepted this claim. One would then have a reason for saying that some questions of metaphysics are fundamental. But it is not clear that this would satisfy Paul and Lowe. For one must acknowledge that questions about fundamentality themselves constitute a rather small part of the subject matter of metaphysics. And so it would

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<sup>14</sup> Thank you to a referee for making this suggestion.

<sup>15</sup> Though an essay competition put on by the Foundational Questions Institute (FQXi) in 2018 on the question ‘What is Fundamental?’ did receive many entries from physicists proposing answers to this question.

remain to provide a defense of the rest of metaphysics, including those questions that Paul and Lowe singled out as fundamental.

### 5. Egalitarian Proposals

So suppose one decides that, after all, there is no legitimate sense in which metaphysics is more fundamental than science. What is then to be said about the threat of obsolescence described at the beginning of this paper? What work could there plausibly be for the metaphysician, if metaphysics and science address a common set of questions?

It is worth noting that the proposal that metaphysics has a subject matter more fundamental than science is actually stronger than what is required to respond to the obsolescence concern. The weaker claim, that the subject matter of metaphysics is simply *different* than that of science, would also serve to evade the worry if justified. Insofar as we are trying to find a nonredundant job description for a naturalized form of metaphysics, we just ought to find a plausible way of making a distinction between the subject matter of metaphysics and that of science that doesn't involve metaphysics's describing some supernatural or transcendental realm. And there are ways to do this. I call these egalitarian models of the relationship between science and metaphysics because they in no way require seeing metaphysics as more fundamental than science, nor science as more fundamental than metaphysics.

One form of egalitarian proposal is in line with part of what Lowe suggests, and is advocated by Ladyman, Ross, and Spurrett (2007) as the main task of naturalized metaphysics. They propose the principle of naturalistic closure which says:

Any new metaphysical claim that is to be taken seriously at time *t* should be motivated by, and only by, the service it would perform, if true, in showing how two or more specific scientific hypotheses, at least one of which is drawn from fundamental physics, jointly explain more than the sum of what is explained by the two hypotheses taken separately. (2007, p. 37)

Thus, the role of metaphysics is to discover connections between explanations provided by existing scientific theories. The job of the metaphysician is to foster the unity of science. This is a project that Ladyman et. al. take to be outside of the scope of any particular science, requiring as it does knowledge drawn from multiple scientific theories.

It is not completely clear to me that these kinds of unification projects lie outside of the domain of what science aims to accomplish. Although earlier models of the sciences (such as Oppenheim and Putnam's) took them to be neatly partitioned into distinct subject matters, we ought to recognize that scientific research often crosses such boundaries, explicitly taking on (reductive) projects of unification.<sup>16</sup> Many (philosophers) would argue that such projects are ideally conducted collaboratively by scientists across the relevant disciplines working in concert with philosophers. But my point is only that the project of connecting the results of diverse scientific disciplines, indeed, even the project of making general claims about the nature of the world in light of all the scientific knowledge we have, is not clearly something solely in the purview of metaphysics. This is work that arguably lies in the boundary between science and metaphysics and is often

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<sup>16</sup> Neuroscience is an obvious case of a science that often crosses what Oppenheim and Putnam (1958) labeled disciplinary boundaries, and as argued in Bickle (2013), often takes on projects of unification.

carried out by scientists. So it is not clear that the (in my view, correct) claim that metaphysics may contribute to the project of unifying scientific results provides an adequate response to the obsolescence concern.

Moreover, I would like to point to an additional role for the naturalized metaphysician, a role many metaphysicians actually take on, and one that allows a more satisfying response to the obsolescence concern.<sup>17</sup> These metaphysicians seek to discover facts that one would hope lie in the domain of science (and so are no more fundamental than the subject matter of science) but are as a matter of fact left open by actual, current scientific theories. Science may leave these questions open for a number of reasons. In some cases this is because scientific work underdetermines how best to interpret a theory that has been confirmed. In other cases, the metaphysician may be addressing questions that the methods of science are not capable of addressing, given contingent and perhaps temporary computational or experimental limitations. Many cosmological questions have or have until recently had this status.

Here, what undermines the obsolescence of metaphysics is the fact that science is as it stands unfinished, and yet there are questions that we may at least make some progress on from the armchair. This is compatible with a naturalistic attitude when one remains optimistic that future scientific theories will do better at addressing the target phenomena. Some naturalists might insist, perhaps motivated by the sort of evolutionary concerns we saw raised by Ladyman, Ross, and Spurrett, that conclusions reached by the a priori methods of metaphysics aren't trustworthy enough to license belief in the same way scientific conclusions are; they thus have a weaker epistemological standing. This is something that may be acknowledged and accepted by the metaphysician, even as she continues to pursue her work. Given the interest and importance of many of these questions, the inevitable lack of certainty we will achieve doesn't motivate ignoring them, and thus one might find an important role for metaphysics that exploits the limitations of current scientific inquiry.

One might ask at this stage whether this way of viewing the questions of metaphysics as different from but not more fundamental than those of science is really a significant departure from the positions advocated by Paul and Lowe. Perhaps it was just a blunder for them to suggest that metaphysics was more "fundamental" than science in the sense in which physics is often taken to be more fundamental than biology. Is there a reason to think their claims of fundamentality were doing any important work that couldn't also be done by the weaker claim of a distinction in subject matter?

I think the claim that the questions of metaphysics are more fundamental than those of science was intended to do significant work for these authors. For it is often recognized that a claim that a set of truths possesses a kind of fundamentality vis-à-vis some other set of truths is a claim that has a kind of power. In the case of physics, the fundamentality of some of its theories (in the sense of their special explanatory power) has been debated precisely because such claims are taken to justify the substantial investment in financial and human capital required for advances in these fields (e.g. in Weinberg 1992). When the condensed matter physicist Philip Anderson claimed that materials science too "requires research which I think is as fundamental in its nature as any other" (1972, p. 393), he used this claim of fundamentality to motivate greater investment in this kind of research, thus justifying the field's importance. A claim of *difference* of subject matter

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<sup>17</sup> This is developed and defended in other work. See especially Ney (2012).

alone, unlike a claim of its fundamentality, will not help to justify a discipline's importance and pleas for continued or increased investment. For this reason, by undermining the claim that metaphysics is fundamental, we may also give up a justification for the field's importance. This is a cost that the egalitarian views I describe in this section will have to address – we will have to say something more in favor of the importance of the questions I have gestured at as distinctive questions of metaphysics.

Moreover, the fundamentality of a discipline's subject matter also connects with issues of its autonomy. As we saw in Section 2, although independence may not be a sufficient condition for the fundamentality of a subject matter, it may be necessary for it. If so, the relative fundamentality of metaphysics would seem to have consequences for the independence of metaphysical research from scientific results. Lowe explicitly embraces this fact, advocating not only the fundamentality, but also the autonomy of metaphysics with respect to science. Lowe claimed, as we saw, that metaphysics is "beholden neither to the empirical sciences nor to the a priori sciences of logic and mathematics." If Lowe were to reject his claim about the fundamentality of metaphysics, then he would have to find some other way of justifying this assertion of autonomy.

Paul (2012b), on the other hand, wants to say that in practice, metaphysics must be informed by science and shouldn't rule out candidate theories that are regarded as epistemically possible within science. She thus doesn't seem to be concerned with advocating autonomy for metaphysics as a discipline. But the trouble is that this innocent-looking naturalistic attitude entails a *rejection* of the autonomy of the questions of metaphysics from those of science. And this seems to create a tension with her claim that metaphysics is more fundamental than science, unless we find some plausible reason to sever the connection between a discipline's relative fundamentality and its relative autonomy. A better option for the naturalist, even a weak naturalist who just wants to hold that metaphysics should be informed by and not conflict with scientific results like Paul, may be to reject the fundamentality of metaphysics and adopt one of the egalitarian proposals I described.

## 6. Conclusion

So I do think the naturalist can find a role for metaphysics in addressing a distinctive set of questions. Some of these will be questions the scientist herself may be interested in addressing, and so the metaphysician and scientist often in practice will work together to address these issues. We see this in the interdisciplinarity of discussions on a number of topics from the ontological status of field representations to the status of individuals across the sciences (Guay and Pradeau 2015), even in discussions of the nature of causality. However, as for the main senses in which some scientific theories are said to be more fundamental than others, the sort of metaphysical questions that are typically addressed are not, as is sometimes claimed, more fundamental than those of science.

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