The Tools of Metaphysics and the Metaphysics of Science

Theodore Sider

Preface

This book is about issues at the intersection of metaphysics and the philosophy of science, especially the philosophy of physics. It is written in the belief that each of these fields can learn from the other.

Projects straddling fields face an inherent danger: that their forays into the field further from the writer's own will be superficial and engage inadequately with that field's internal concerns. Philosophers of science may find some of my focus alien, overly metaphysical. I am sensitive to this danger, and offer my contributions in a spirit of collaboration.

But philosophers of science sometimes overestimate the gulf between themselves and metaphysicians. They regard metaphysicians as a credulous lot who uncritically assume the intelligibility of questions beyond those justifiable from a sober scientific outlook. Sometimes this is indeed true. But sometimes something else is going on. Philosophers of science often take implicit stands themselves on various metaphysical issues, sometimes without noticing it. Metaphysicians didn't invent metaphysical issues; they simply made them explicit. When trying to investigate what physical and other scientific theories tell us about the nature of reality, it's inevitable that one would bump up against the very general questions about reality with which metaphysicians wrestle.

Thus I hope that philosophers of science will take seriously the issues I raise, and come to see that some of my concerns bear on their own. Concerns from the philosophy of science have certainly influenced my own thinking about metaphysics.

Chapters 2–5 are on, respectively, the relation between properties and the laws of nature, individuals and identity, quantitative properties, and theoretical equivalence. They can mostly be read independently, although Chapter 1, which introduces the conceptual framework of the book, should be read, or at least skimmed, first. Of Chapters 2–5, Chapter 2 (properties and laws) is the most purely metaphysical; philosophers of physics may wish to move quickly

to Chapters 3–5 (although section 2.3 introduces an idea that will be important later). The final chapter is a brief synoptic conclusion.

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Chapter 1

Postmodal Metaphysics and Structuralism

1.1 Tools in metaphysics

By "tools in metaphysics" I mean the core concepts used to articulate metaphysical problems and structure metaphysical discourse. They are a lens through which we view metaphysics.

The metaphysical tools of choice change over time, and as they do, the problems of metaphysics are transformed. We view the very same problems through different lenses. In the 1950s and 1960s the preferred tools were concepts of meaning and analysis. So when personal identity over time was discussed, for example, the question was, what are we *saying* when we re-identify persons over time?[1] In the 1970s through to the 1990s, the tools became modal, and the questions of personal identity underwent a corresponding transformation: what conditions governing personal identity hold of metaphysical necessity? Would it be possible to survive the loss of all of one's memories?

The mind–body problem had a similar arc. In the 1950s the goal was to give an analysis of mental concepts, but later the questions became modal; whether, for instance, it would be possible for a world physically like ours to lack consciousness.

Like all philosophical questions, metaphysical questions begin life in vague, primordial form. The mind and the body: what's up with that? How are they related? Before real progress can be made, the questions must be made precise,

[1] See Strawson (1959), for instance.

and placed in a developed theoretical setting. This is the job of tools of metaphysics. With particular tools in hand, the primordial questions begin to seem, in retrospect, as first attempts to ask what was the proper question all along. The proper questions will be viewed as *better* than the questions yielded by rival tools—clearer perhaps, or more precise, substantive, or objective; or better in lacking false presuppositions, or being less susceptible to being confused by misleading natural language, or having a better associated methodology, or being more likely to connect with questions outside metaphysics.

1.2 Postmodal metaphysics

Recently there has been a shift to new tools (or perhaps a return to old ones), which I will call "postmodal". David Lewis (who had also been a leader in the modal revolution) enriched his conceptual toolkit with the concept of *natural properties and relations*—those elite properties and relations that determine objective similarities, occur in the fundamental laws, and whose distribution fixes everything else. I myself have argued for the centrality of a concept that is closely related to Lewis's notion of naturalness: the concept of structure, or as I'll put it here, the concept of a *fundamental concept*. Fundamental concepts are not limited to those expressed by predicates; we may ask, for instance, whether quantifiers or modal operators express fundamental concepts—whether they help to capture the world's fundamental structure. Kit Fine (re-)introduced the concept of *essence*, and argued that it should not be understood modally. He pointed out that although it does seem to be an essential feature of the singleton set {Socrates} that it contain Socrates, it does not seem to be an essential feature of Socrates that he be contained in {Socrates}; being a member of this set is not "part of what Socrates *is*". Thus we cannot define a thing's essential features, as it had been common to do in the halcyon days of the modal era, as those features that the thing possesses necessarily, for it is plausible that Socrates possesses the feature of being a member of {Socrates} necessarily.[2] Fine also (re-)introduced a notion of *ground*. One fact grounds another, he said, if the second holds in virtue of the first—if the first explains, in a distinctively metaphysical way, the second. Interest in ground and related concepts over the past ten years or so has been intense.

Friends of the postmodal revolution think that modal conceptual tools need to be supplemented, or perhaps even replaced, by one or more of these

[2] See also Dunn (1990, section 4).

postmodal concepts.[3] A recurring refrain has been that modal concepts are too crude for many purposes, in that even after modal questions are settled, there remain important questions that can be raised only by using the postmodal tools. Fine's example of {Socrates} illustrates this, as does the often-cited example of the Euthyphro question: even after it is settled that something can be pious if and only if the gods love it, there is a further question, that of whether something is pious because the gods love it, or whether the reverse is somehow true. This appears to be a question of ground.[4] Another refrain has been that modal truths are often epiphenomenal, a mere reflection of deeper postmodal structure.

The story of a linear progression from conceptual analysis to modality to fundamentality/essence/ground is an oversimplification. For instance, inspired by Quine's 'On What there Is', much metaphysical inquiry has centred on ontological questions, questions structured by the concepts of ontology (for Quineans, first-order existential and universal quantification). From 1980–90, three of the major works of metaphysics were focused on ontology: Field's *Science without Numbers*, Lewis's *On the Plurality of Worlds*, and van Inwagen's *Material Beings*.[5]

Nevertheless, the final transition in the simplified story is what will be important here: the shift from modal to postmodal tools. I'm interested in how the shift affects first-order metaphysical questions. (I'm also interested in the reverse direction of influence, what the tools' repercussions for first-order questions can teach us about the tools. As we will see, in certain contexts, particularly in the metaphysics of physics, the appropriate tool is fundamentality, rather than essence or ground.) The postmodal revolution has been very "meta", about what we're asking when we ask metaphysical questions. But the choice of tools also affects the questions' answers. The matter of tools isn't purely methodological, or more a priori, or anything like that. It isn't "first metaphysics", in the sense that it must be done before, and in isolation from, the rest. It's just more metaphysics, albeit especially intertwined with a wide range of other questions.

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[3] See Bennett (2017); Fine (1994*a*,*b*, 2001, 2012); Rosen (2010); Schaffer (2009); Sider (2011).

[4] See Evans (2012).

[5] And indeed, Schaffer's (2009) defence of ground focuses on the limitations of a purely ontological approach to metaphysics more than on the limitations of a purely modal approach.

1.3 Structuralism

If this book has a single thesis, it is that the choice of metaphysical tools matters to first-order metaphysics, especially when it comes to "structuralist" positions in the metaphysics of science and mathematics.

'Structuralism' is pretty vague, but the idea is that patterns or structure are primary, and the entities or nodes in the pattern are secondary.

The argument for structuralism is often epistemic: our evidence is only for patterns. One could respond with a merely epistemic doctrine: all we know is the pattern; what instantiates the pattern is real but unknown.[6] But structuralists respond metaphysically: the patterns are metaphysically, not just epistemically, primary.

Such epistemic arguments have close nonepistemic cousins: that mere differences in nodes are distinctions without a difference. And there can also be entirely nonepistemic arguments, such as that dispensing with the nodes while keeping the structure yields a simpler picture of the world.

Structuralist positions have been defended in a number of different areas in the metaphysics of science and mathematics (and elsewhere). I will focus on three: nomic essentialism, comparativism about quantity, and structuralism about individuals.

According to nomic essentialism, networks of nomic, or lawlike, relations between properties are primary and the properties themselves are secondary. When a law of nature governs a property, this isn't something that just happens to the property. The nature of the property itself is somehow bound up with the laws governing it and other properties.

Why believe such a claim? One putative reason is epistemic. What we know of the property of charge (for example), we know through its nomic profile: entities with this property are correlated, by law, with the electromagnetic field, which is in turn correlated with the motions of other particles, depending, in part, on their charges. What do we know of the property of charge *in itself*? Nothing—we know of it only as "that which is correlated, by law, with such-and-such". So why assume that there *is* anything more to the property than this lawful correlation?

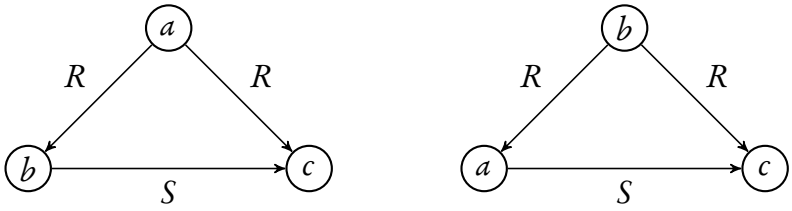
That was nomic essentialism, but there are also the closely related doctrines of dispositional and causal essentialism, according to which, respectively, the

[6] Examples include what Ladyman (1998) calls epistemic structural realism and the "humility" theses of Langton's (1998) Kant, and Lewis (2009).

dispositional and causal roles of properties are prior to the properties themselves.

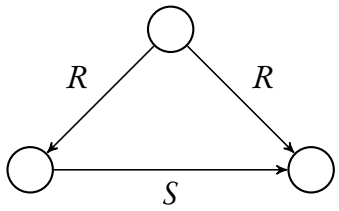
Another form of structuralism pertaining to properties concerns quantitative properties, those that can be measured by numbers. Charge and mass, for instance, come in degrees, which we represent with numbers. Now, for any distribution of values for a given quantity across all individuals—an assignment of 2 g mass to this thing, of 1 g mass to that thing, and so on—there is a network of corresponding relations amongst those individuals: one individual is twice as massive as another, a certain pair of individuals are together exactly as massive as a certain other pair, and so on. According to a structuralist view of a quantity, often called "comparativism", the network of relations is prior to the individual values for that quantity. Like nomic essentialism, this form of structuralism can be supported on epistemic grounds: we observe relational rather than absolute quantitative facts, as when we use a set of scales to establish that two things are exactly as massive as each other.

Yet another form of structuralism pertains to individuals: the network of qualities—properties and/or relations—had by individuals is primary and the individuals themselves are secondary. And again there is an epistemic argument. We seem to have no way to distinguish between the following two arrangements:



Observation tells us only the qualities of individuals, and not which individuals they are; individuals don't have metaphysical nametags. So why suppose that there exists something beyond the qualities, an extra fact of which things occupy which places in the network of properties and relations, which can vary independently of the network? Why suppose there's a different possible world that is qualitatively just like ours, except that Barack Obama and I have "exchanged places", so that I am a 6-feet-1-inch-tall politician born in a state known for its beaches and volcanoes, and he is a 5-feet-9-inch-tall philosopher from a city known for its cheesesteaks and unruly sports fans? Why not suppose instead that the identities of individuals cannot vary independently of the

pattern, and indeed that the pattern is all there is?:



Structuralisms about individuals have been defended within pure metaphysics—the bundle theory, for example. And recently such a position has been developed in the philosophy of science: structural realism. A related position is also defended in the philosophy of mathematics, only here the chief argument is not that all we *observe* is the pattern—since we don't observe mathematical entities—but rather that the pattern is all that matters to the practice of mathematics. What's distinctive of the natural numbers, for instance, is that they be an 'infinite series each of whose members has only finitely many precursors', as Quine (1960*b*, p. 242) put it. It doesn't matter to mathematics which individuals are in this structure or what their intrinsic features are; all that matters is that they be so structured. So perhaps all there is to the natural numbers is this structure.

1.4 Modal and postmodal structuralism

All this talk of patterns being "primary", of patterns being "all there is", is extremely vague, and how it is precisified depends on the metaphysical tools one adopts. For instance, using modal concepts one can say that nodes and patterns cannot vary independently; and many structuralist positions have in fact been formulated in this way.

One form a modal structuralist thesis can take is this: the pattern cannot vary while the nodes remain constant. Dispositional essentialism, for instance, has usually been articulated as the claim that the very same properties and relations could not have existed while having different dispositional features; the network of dispositional relationships amongst properties and relations cannot vary while the identities of those properties and relations remain constant. Modal structuralist theses can also take the converse form: nodes cannot vary while the pattern remains constant. Structuralism about quantities can be understood as the claim that any two possible worlds that are alike in their distribution

of quantitative relations (relations like being-twice-as-massive-as) are alike simpliciter with respect to quantities; thus doubling everything in mass does not result in a different possible world. Structuralism about individuals can be articulated as antihaecceitism, the claim that it's impossible for individuals to vary independently of qualitative facts—that is, that there are no two possible worlds that have the same distribution of qualities over individuals, but in which different individuals occupy different qualitative roles; there is no duplicate possible world in which I have exchanged places with Barack Obama.

Now, in the case of mathematical individuals, no one construes structuralism modally, because facts about mathematical entities are generally taken to be necessary. Anyone who accepts this dogma already thinks that it's necessarily true that the number 1 occupies its place in the structure of natural numbers, for instance, and yet it's often thought that some question of structuralism remains open.[7]

From a postmodal point of view, the failure of modal tools to articulate a meaningful thesis of mathematical structuralism is a sign of a deeper problem. *Any* modal thesis is bound to be unsatisfying as a formulation of any form of structuralism, because modality is "insensitive to source", as Fine (1994*a*, p. 9) puts it. A modal structuralist thesis says that independent variation of patterns and nodes is impossible, but says nothing about *why* this is impossible; the impossibility might be due to something that, intuitively, has nothing to do with structuralism. This is made vivid by an example due to Shamik Dasgupta (2011, p. 118). Suppose that a very surprising "Spinozistic" thesis is in fact true of modal reality, namely that all truths are true necessarily. Then each modal structuralist thesis would automatically be true. Nodes and patterns can't vary independently because nothing can vary at all. But this would not be because of any priority of patterns over nodes; it would be because of the quirky nature of modality.[8] A more satisfying statement of a structuralist position will no doubt *imply* a modal thesis, but that modal thesis would be due to some

[7]The problem could be avoided by denying that mathematics is necessary. But if this denial is because of a more general claim that the necessary truths are "minimal" (see later in this section), that minimality claim (if not underwritten by some postmodal thesis) might be inconsistent with the modal articulation of mathematical structuralism.

[8]See also Fine's (1995, p. 271) point about the Tractarian view that all objects exist necessarily. As John Hawthorne pointed out to me, these arguments are perhaps less decisive than they initially appear. A friend of modality might insist that Spinozism *would* obliterate questions of structuralism, much as a friend of ground would need to insist that bizarre theories of ground, such as that nothing grounds anything, would obliterate questions of structuralism. The latter insistence strikes me as more reasonable, but others may disagree.

deeper nonmodal thesis: nodes and patterns can't vary independently because nodes and patterns are tied together in some nonmodal way. For example, a postmodalist won't take antihaecceitism as the statement of a structuralist position since antihaecceitism is a modal thesis, but will seek instead some nonmodal formulation, for example the thesis that individuals just are bundles of universals. This thesis *implies* the modal thesis (given plausible principles connecting modality to claims of the form '*X* just is *Y*'[9]), but is a distinctively structuralist claim about the nonmodal tie between individuals and qualities.

Postmodalists have a similar attitude to modal formulations of many other metaphysical doctrines, not just structuralism. The modal thesis of mind-body materialism, that there is no mental difference without a physical difference, is all well and good, but to what is it due? What is it about the nature of mind that rules out the possibility of independent variation of the mental? A satisfying materialism would give some answer, such as that there are no fundamental mental properties or relations, and that all fundamental properties and relations are physical.[10]

I'm going to assume that modal articulations of the structuralist positions to be considered in this book are indeed inadequate, and further, that postmodal articulations are needed. Though I won't say much in support of this assumption, it's worth distinguishing some different groups of philosophers who would accept it.

One group would oppose modal articulations of structuralism because they think that modality is *nonfundamental*. If modality is nonfundamental then any modally-articulated structuralist thesis would not itself be fundamentally true, but would rather be due to certain facts about fundamental reality; and a structuralist might prefer to articulate those facts directly. To be sure, it isn't true in general that metaphysical theses must always be articulated in perfectly fundamental terms. Criteria of persistence for entities falling under nonfundamental sorts (say, persons) are most appropriately stated using nonfundamental concepts (psychological concepts, perhaps). To take another example, the causal structures at issue in various branches of social metaphysics emerge only in terms of higher-level concepts (Barnes, 2014). But according to this first group, the structuralist theses we are discussing are different: unlike theses of higher-level persistence or higher-level causal structure, they are meant to be theses

[9]See Dorr (2016) and Rayo (2013) on this sort of language.

[10]It's tempting to regard many of the contortions philosophers of mind underwent to construct a proper modal formulation of materialism as the result of struggling to find a modal proxy for a simple idea about what is fundamental.

about fundamental reality, and ought to be concisely stateable in fundamental terms.

A second group would oppose modal articulations of structuralism because they think that modality is not only nonfundamental, but also metaphysically *superficial*. On my own view, for instance, the necessary truths are just certain truths that we "hold constant" when talking about alternatives to actuality, and the distinction between truths we hold constant in this way and truths that we don't hold constant is more or less conventional.[11] Given this approach, if a structuralist thesis aspires to articulate something metaphysically important, it should not do so via the metaphysically superficial language of modality. At best this would be a misleading way to get at an important nonmodal fact, and at worst it would not reflect anything important at all.[12]

A third group thinks that although necessity is metaphysically deep, and perhaps even fundamental, the necessary truths are *minimal*. (Equivalently, they think that the possible truths are plentiful.) Suppose, for example, you think that, with a few exceptions (logical truths, perhaps), no truth is necessary unless it is underwritten by some postmodal claim (such as that individuals just are bundles of universals). You will then be dissatisfied with modal articulations of structuralism, for you will think they can't be true unless underwritten by some appropriate postmodal claim.

Finally, a fourth group thinks that modal structuralist theses may well be true, metaphysically deep, and even fundamental, but nevertheless are *unsuitable* statements of structuralism because they are not supported by structuralist arguments. Consider the argument that permutations of individuals amongst qualitative roles are distinctions without a difference. The modal formulation of structuralism about individuals—antihaecceitism—wouldn't, in my view, be supported by this argument, since it doesn't imply that permutationally different scenarios aren't different; it just implies that they aren't both possible. Or consider epistemic arguments that only structuralism can explain our knowledge of the domain in question; one might think that a merely modal formulation of structuralism, even if true, couldn't explain our knowledge.[13]

[11] See Sider (2011, chapter 12). Sidelle (1989) holds a similar view; see also Nolan (2011).

[12] To be sure, a shift to postmodal concepts wouldn't improve the situation if those concepts were themselves superficial; see Dasgupta (2018*b*).

[13] Compare Dasgupta (2011).

1.5 The challenge for postmodal structuralism

The demand for postmodal formulations of metaphysical doctrines can make a difference: there is no guarantee that a given doctrine *can* be formulated postmodally.

One obstacle is that there may not be any coherent postmodal thesis in the vicinity. Consider structuralism about individuals, a view which seeks to somehow "downgrade" particular individuals relative to their qualitative structure. The most straightforward kind of downgrading is elimination: fundamentally speaking there exist no individuals, only a structure. But this appears to make no more sense than the Cheshire Cat's lingering smile. For what a qualitative structure *is*, is some individuals instantiating properties and relations.

I don't mean to suggest that no response is possible—hence the term 'obstacle'. There are other ways one might attempt to downgrade the metaphysical status of individuals, as we will see in Chapter 3. The question is whether any account is both coherent and avoids other obstacles.

(Many structuralist views merely prioritize relations over properties, rather than prioritizing relations and properties over the entities that instantiate them, and hence don't face this obstacle. For example, meaning holists claim that meaning ultimately consists, not in the possession of semantic properties by individual words or sentences, but rather in a network of semantic relations across all words or sentences. This view makes a claim about which kinds of features are present in the most fundamental semantic facts—relations, not properties—but the existence of the entities possessing those features—words, or sentences, understood in some nonsemantic sense—isn't denied or understood structurally. This all is perfectly straightforward, metaphysically.)

Another obstacle is that there might be a conflict with "postmodal logic". A natural strategy for formulating structuralism appeals to ground: facts about the pattern somehow ground facts about the nodes. And it's natural to take "facts about the pattern" to be existentially quantified facts whose instances are facts about nodes. Thus existential facts would ground their instances. But the usual logic of ground demands the reverse: instances ground existentials. The problem, again, simply doesn't arise if one articulates structuralism in merely modal terms. Ground is a hierarchical notion—facts are arranged in a hierarchy of more or less basic facts according to certain rules—and this additional imposed constraint can conflict with a structuralist thesis.

A third potential obstacle is that even if a modal position can be "translated" into a coherent and consistent postmodal thesis, that thesis might be

theoretically unattractive from a distinctively postmodal point of view. For instance, if a postmodal structuralist thesis is a claim that certain concepts are fundamental, it may be that the concepts required to state the structuralist thesis are complex in certain objectionable ways, or cannot be used to state suitable laws of nature—complaints that flow from a natural epistemology for fundamentality, as we will see.

The preceding was not intended as a blanket argument against all forms of structuralism. 'Structuralism' is too broad a term to allow for meaningful debate at such a level of generality; we must examine each case individually. Still, I do think that in some cases, structuralism is an idea that looks good when viewed through the metaphysically superficial lens of modality, but becomes much less attractive when we turn up the metaphysical resolution.

We will discuss all this—the various forms of structuralism, and the concerns about what they might amount to in postmodal terms—in more detail in subsequent chapters. For the remainder of this chapter let us look more closely at various postmodal concepts, beginning with essence.

1.6 Essence

Fine's example of Socrates and the singleton set of Socrates is the intuitive heart and soul of the contemporary discussion of essence: it is meant to convince us that there is a real distinction between those facts or features that are, and those that are not, part of a given thing's nature; and it is thought that this distinction cannot be captured in modal terms.

Fine explores various ways to formalize discourse about essence; we can focus on the regimentation $\Box_{x_1,x_2\ldots}A$, which says that A holds in virtue of the natures of entities $x_1, x_2 \ldots$. Thus the true claim that it's of the essence of {Socrates} to have Socrates as a member would be regimented as:

$$\Box_{\{\text{Socrates}\}} \text{Socrates} \in \{\text{Socrates}\}.$$

and the false claim that it's of the essence of Socrates to be a member of {Socrates} would be regimented as:

$$\Box_{\text{Socrates}} \text{Socrates} \in \{\text{Socrates}\}.$$

As we've seen, Fine denies that essence should be defined in terms of necessity. Indeed, Fine accepts the reverse direction of definition: a necessary

truth is a truth that holds in virtue of the essences of all things.[14]

1.7 Ground

Turning next to ground, we may again begin with Fine's regimentation: one or more facts $f_1, f_2 \ldots$ are said to ground another fact, g:

$$f_1, f_2 \cdots \Rightarrow g.$$

There are many subtle details which I'll mostly ignore or elide: I'll alternate between speaking of grounding of facts, propositions, and speaking of grounding using a sentence operator, and I'll mostly (though not always) ignore distinctions between full, partial, strict, weak ground, and the like.

Philosophers often speak of facts "holding in virtue of", "being grounded in", "depending on", "consisting in", "being explained by", or "being made true by" other facts. As Gideon Rosen (2010) vividly recounts, we have long viewed such talk with suspicion, preferring instead allegedly clear modal and other language, at least when we're trying to be rigorous. But Rosen, Fine (2001, 2012), Jonathan Schaffer (2009), and many others now say that such talk is legitimate after all. It concerns a relation of grounding, which is an irreplaceable conceptual tool in philosophy.

Claims of grounding presumably *imply* modal claims: if f grounds g then f necessitates g.[15] But the converse implication doesn't hold: even if it happens

[14] Fine (1994*a*, p. 9). Incidentally, I doubt this is right. There are some subject matters where the truth is necessary, whatever that truth happens to be, but where the truth isn't settled by the essences of the entities involved. For example, for a certain sort of realist about set theory, either the continuum hypothesis or its negation is true; and whichever is true is necessarily true. But this doesn't seem to be settled by essences (by the essence of set-membership, say). It's just a fact about what sets happen to exist. (See Sider (2011, p. 267).) Similarly for the principle of universal composition, according to which any plurality has a mereological sum: it's necessary if it's true, but its truth doesn't seem to be due to essences. Fine himself might bring in his postulational account of existence (2007) to claim that these truths are essential after all: the idea might be, in the case of set theory, that we can choose which notion of set-membership to adopt, and that sets obeying the laws corresponding to that notion are thereby postulationally introduced, with truths about them holding in virtue of the essence of the chosen notion. But this reply seems unavailable given a more orthodox Platonist conception of mathematical existence.

[15] Although this is so according to "grounding orthodoxy" (e.g./i.e. Fine (2012)), others uphold some weaker connection to modality. See Bliss and Trogdon (2016, section 5).

to be necessary that g obtains whenever f does, there may not be the right sort of connection between f and g so that f grounds g.

Many of the traditional questions of philosophy, it is said, are really about grounding. The question of moral naturalism, for instance, should really be understood as the question of whether moral facts are grounded in natural facts. It is a distortion to understand the question in modal terms, for instance as the question of whether moral facts are necessitated by natural facts, since according to many moral nonnaturalists, even though moral facts are "above and beyond" the natural facts, they nevertheless cannot vary independently of the natural facts. (And recall Dasgupta's point about the Spinozistic view that every truth is necessary.)

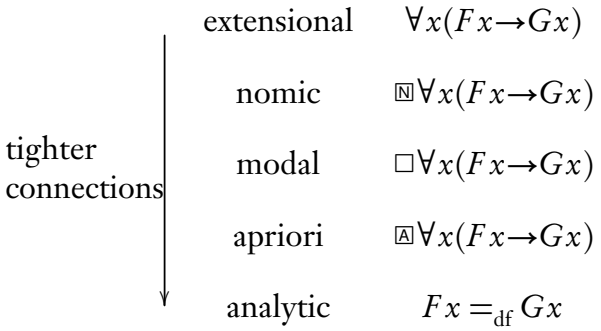
1.7.1 Ground and levels

There is a familiar "levels" picture of reality, in which facts at "higher" levels rest on facts at "lower" levels, with everything ultimately based on a ground floor of fundamental facts. Perhaps psychological facts are higher than chemical facts, which in turn are higher than physical facts, which are in turn fundamental facts.

The levels picture has always faced the question of how the levels are related. In his classic discussion of theoretical reduction, Ernest Nagel (1961, p. 354) himself mentioned three views of the status of his "coordinating definitions", which connect higher- and lower-level concepts in theoretical reductions. Coordinating definitions can be analytic, Nagel said, they can be stipulated by fiat, or they can be "factual" or "material". None of these three ideas seems correct as an account of the relationship between facts or properties at different levels. The third idea is apparently that of a relationship of lawful co-variation between metaphysically separate, metaphysically coequal partners; but the levels picture is meant to articulate some metaphysically "tighter" connection—the lower levels in some sense *constitute* the higher levels. The relationship between statistical mechanics and thermodynamics should not be assimilated to that between the past and the future. The first and second ideas move in the direction of a tighter connection, but go too far: the relationship between the levels is discovered, not stipulated, and isn't a mere matter of meaning. What is wanted is a metaphysical not semantic relationship, but a tighter one than "material".

When I was in graduate school, a certain view was common of the available options for connecting distinct properties or subject matters, and more generally, for giving a philosophical account of something. The main two were

definitions and synthetic necessities. One could say "x is good $=_{\text{df}}$ x causes pleasure", where the '$=_{\text{df}}$' was understood to be, in some sense, a matter of ordinary meaning. Or one could deny that 'good' can be defined (in the $=_{\text{df}}$ sense) but still hold it to be necessarily true that, for instance, anything that causes pleasure is good. A few other options were recognized (though not all of them were regarded as appropriate for philosophical accounts): extensional, nomic, and apriori. These connections can be ordered by the tightness of the connection:[16]



But it is natural to think that some further connection, intermediate in tightness between the modal and apriori, must be recognized. The connection between levels is metaphysical, not apriori; but it's tighter than a merely modal connection, for as we saw, domains can be modally connected even when there is no "constitutive connection", as was illustrated most dramatically by the Spinozistic view that all truths are necessary. Also, as Fine (and Jaegwon Kim (1990, section 4) before him) has emphasized, modal connections are not asymmetric. Its being necessary that all Fs are Gs leaves open that it's also necessary that all Gs are Fs; A supervening on B (in various senses) leaves open that B might also supervene on A. But, Fine argued, the levels picture (not his phrase) demands an asymmetric connection between lower and higher levels. Fine puts all this well, in a discussion of how to understand materialism about the mind:

[16]The ordering is oversimplified, in light of, for instance, the contingent apriori (Kripke, 1972). Also, to facilitate comparison with ground, the diagram lists "conditional" connections (except $=_{\text{df}}$); but one could instead consider biconditional connections: $\forall x(Fx \leftrightarrow Gx)$, $\Box\forall x(Fx \leftrightarrow Gx)$, etc. Correspondingly, one could consider a biconditional groundlike concept $\Leftrightarrow$, intermediate in tightness between modal and apriori equivalence. It would be biconditional in that $A \Leftrightarrow B$ would imply $\Box(A \leftrightarrow B)$, but nevertheless be asymmetric (as ground is normally held to be): if $A \Leftrightarrow B$ then $B \not\Leftrightarrow A$.

> It will not do, for example, to say that the physical is causally determinative of the mental, since that leaves open the possibility that the mental has a distinct reality over and above that of the physical. Nor will it do to require that there should be an analytic definition of the mental in terms of the physical, since that imposes far too great a burden on the [materialist][17]. Nor is it enough to require that the mental should modally supervene on the physical, since that still leaves open the possibility that the physical is itself ultimately to be understood in terms of the mental.
>
> The history of analytic philosophy is littered with attempts to explain the special way in which one might attempt to "reduce" the reality of one thing to another. But I believe that it is only by embracing the concept of a ground as a metaphysical form of explanation in its own right that one can adequately explain how such a reduction should be understood. For we need a connection as strong as that of metaphysical necessity to exclude the possibility of a "gap" between the one thing and the other; and we need to impose a form of determination upon the modal connection if we are to have any general assurance that the reduction should go in one direction rather than another.
>
> Fine (2012, pp. 41–2)

Thus the relation between facts at different levels is naturally taken to be ground: lower-level facts ground higher-level facts.[18]

1.7.2 Wilson's challenge

Jessica Wilson has argued that ground is in fact useless in philosophy. Consider its putative use in articulating "naturalistic" positions. According to Wilson, the bare claim that the mental, say, is grounded in the natural is neutral over a range of more specific positions involving more specific metaphysical relations such as type identity, token identity, functional realization, part–whole, and so forth. (Wilson calls the generic grounding relation Grounding with a capital G, and calls the specific metaphysical relations grounding-with-a-lowercase-g relations.) She says:[19]

[17] Fine says "anti-realist", but he uses that word idiosyncratically; my substitution is arguably equivalent.

[18] I don't mean to suggest that there is any simple definition of the levels hierarchy in terms of ground, nor that all facts can be partitioned into levels.

[19] Wilson (2014, p. 546). Bennett (2017) and Kovacs (2017, 2018) make related claims, though Bennett holds that grounding claims—or rather, generic building claims, in her

> Hence it is that naturalists almost never rest with the schematically expressed locutions of metaphysical dependence, but rather go on to stake out different positions concerning how, exactly, the normative or other goings-on metaphysically depend on the naturalistic ones.

On Wilson's view, then, grounding (i.e. Grounding) claims have no point; only the more specific claims are of interest.

Someone who viewed ground as a sort of super-added metaphysical force, so that facts about grounding are themselves fundamental facts not grounded in any further facts, would not agree that grounding claims are neutral over more specific positions; the grounding claim itself would count as another one of those specific positions. This isn't a very attractive view of ground though (we'll discuss it further shortly).

In my view Wilson is importantly right about something. When we attempt to say what is ultimately going on in some domain, metaphysically speaking, we don't stop with a claim of ground. We don't just say that the mind is grounded in the body and leave it at that (setting aside the super-added force conception of ground). Instead, as Wilson says, we go on to say something more specific about the connection between the mind and the body. I will argue later (sections 2.3 and 3.11) that, for this reason, neither ground nor essence is suitable as a tool for articulating the kinds of structuralist theses that are at issue in this book. (Thus the proper postmodal tool for our purposes is fundamentality.)

But in other contexts, a less specific, more neutral claim is exactly what we want; thus I think that Wilson's critique of ground goes too far. We *do* stop with neutral claims of grounding, for instance, when we're stating overarching positions like physicalism or naturalism, or saying what makes more specific positions count as instances of physicalism or naturalism.

Why care about stating such overarching positions? Their usefulness is in their epistemic role. Such sweeping doctrines are epistemically important even if they're unspecific and hence in a sense metaphysically superficial. Take the case of consciousness. Physicalists work very hard to try to show that consciousness is somehow a physical phenomenon. They begin by exploring one sort of way to ground consciousness in the physical, but if that doesn't work, they try another way. Why do they stick to this path; why don't they just give up and concede that consciousness is a wholly nonphysical phenomenon? It's because they take themselves to have very good evidence that *everything* is grounded—in one way or another—in the physical. They think that the many

terms—have a role to play in metaphysics. See also Koslicki (2015).

cases in the history of science in which various phenomena that initially seemed not to be physicalistic were subsequently shown to be grounded in the physical collectively support a sweeping doctrine of physicalism, to the effect that *all* phenomena are grounded in the physical.

This line of thought essentially uses the general notion of ground, and cannot be reconstructed using any more specific relation, since different specific relations may be at issue in the different cases; chemistry, biology, and geology may be based in physics in different ways.[20] Thus the neutrality of ground over more specific metaphysical relations is essential to its epistemic role. (Modality also shares this neutrality.) When we're trying to get to the metaphysical bottom of things, we go deeper than ground. But in certain epistemic contexts it's important not to do this.[21]

To take one other example, anyone who accepts talk of fundamentality will want to state some sort of "completeness" principle, to the effect that all facts "rest" in some way on the fundamental; and it is natural to explicate this resting-on in terms of ground. One completeness principle, for instance, would say that any fact that involves any nonfundamental concept must be grounded in facts that involve only fundamental concepts.[22] Such a completeness principle is not a distinctive statement about what fundamental reality is like. It is rather a constraint on any proposed inventory of the fundamental concepts: the inventory must be rich enough to accommodate all phenomena. To state such a constraint it is important *not* to be specific about the exact nature of resting-on, since different phenomena can rest upon the fundamental in different ways.

1.7.3 Grounding ground

Are facts about ground themselves grounded? Or are they ungrounded, as the "super-added force" view would have it?

[20] Since property identity might be one of the ways (in the case of chemistry, for instance), the argument ought to employ Fine's (2012) notion of weak ground.

[21] Schaffer (2009) has stressed the value of ground in preserving a role for traditional metaphysical disputes given a Moorean respect for common sense (although see Sider (2013, sections 2, 4) against Mooreanism). This is another case in which the metaphysical neutrality of ground is essential: the Moorean demand is that one's fundamental metaphysics be capable of grounding *in one way or another* common sense, not that it ground common sense in one particular way. (See also Fine's (2012, p. 41) discussion of the importance of ground to the project of "critical" metaphysics.)

[22] Compare Sider (2011, section 7.5).

For many grounding facts, such as those connecting levels, there is a powerful argument that they must be grounded. Levels-connecting grounding facts always involve higher-level concepts, because the higher-level fact getting grounded will involve such concepts; and surely no ungrounded fact involves a higher-level concept. Any fact of the form 'X grounds the fact that I am in pain', for instance, involves the property of being in pain, and hence is surely not ungrounded.[23]

The only exception to this sort of argument would be grounding facts involving only fundamental concepts, such as the fact that some particular e's being charged grounds the fact that something is charged. But even these facts seem unlikely candidates to be ungrounded; for why posit a new "super-added" force without good reason?

Thus grounding facts themselves have grounds. What grounds? I doubt there is any simple story to be told here, just as there is no simple story in general to be told about how higher-level facts are grounded. Ground, after all, is itself a high-level notion (assuming we reject the super-added force view), and one of the main reasons to accept ground in the first place is to allow for higher-level facts to depend on lower-level facts in complex ways that may not be accessible to us a priori. But we can make a good guess at the kinds of facts that help to ground grounding facts: patterns in what actually happens, modal facts, facts about the form or constituents of the grounding fact in question, metalinguistic facts, facts about fundamentality, and even (according to some friends of grounding though not me) certain grounding facts involving only fundamental concepts.[24]

1.8 Fundamentality

The final postmodal concept is that of fundamentality.[25] Actually there are two concepts worth distinguishing: that of a *fundamental fact*, and that of a *fundamental concept*.[26] The fundamental facts are those ground-level facts on which everything else rests. The fundamental concepts stand for the ultimate "building blocks" of the world, which "carve reality at its joints" and give it its fundamental structure.

[23] See Sider (2011, sections 7.2, 7.3, 8.2.1).

[24] See Sider (2020) for a fuller discussion of the issues in this section.

[25] The issues in this section are more fully discussed in Sider (2011).

[26] Some also speak of fundamental *individuals*; but see Sider (2011, 8.4–8.7).

Which, if either, of these two notions is more basic? On one view, the fundamental concepts may be defined as those standing for constituents of fundamental facts. I myself prefer to leave 'fundamental concept' undefined (indeed, in my view, concept-fundamentality is itself a fundamental concept). In either case, the fundamental facts might be defined as those lacking grounds, or else taken as undefined. We can remain neutral on such issues.

Although concept-fundamentality is akin to Lewisian naturalness, it is more general in a certain way. There is little difference when it comes to concepts expressed by predicates: we may speak either of the fundamentality of the concept of being 1 g in mass, or of the naturalness of the property of being 1 g in mass. But we may (in my view) speak of fundamentality for concepts signified by expressions in other grammatical categories, such as sentence operators and quantifiers; and it is unclear that Lewisian naturalness can apply in such cases: naturalness for Lewis is a feature of properties and relations, and it is unclear whether the metaphysical function of operators and quantifiers is to stand for properties and relations. Just as Lewis would articulate the view that reality has fundamental "mass structure" by saying that mass properties (or relations) are natural, I would articulate the view that the world has fundamental ontological, or modal, or disjunctive structure by saying that the concepts expressed by quantifiers, modal operators, or the sentence operator 'or' are fundamental concepts. (This use of the term 'structure' has nothing to do with structuralism. The question is rather whether anything about mass, ontology, modality, or disjunction is woven into the ultimate fabric of reality, so to speak.) A concept—whether expressed by a predicate or no—is fundamental if and only if it plays a role in articulating the world's fundamental structure, if and only if it stands for one of reality's ultimate building blocks.

(Although the terminology may suggest otherwise, whether a concept is fundamental is not a matter of its place within our conceptual scheme, nor is it a matter of anything else about us; it is, rather, a purely worldly matter. The reason for speaking of fundamentality in terms of concepts is in large part to facilitate the generalization to logic, where the existence of entities standing to logical words as properties stand to predicates is contentious. See Sider (2011, chapter 6).)

There are certain abstract similarities and differences between the various postmodal notions. First, ground and fundamental facthood are *fact-level* (or propositional) whereas fundamental concepthood is *sub-factual* (or sub-propositional): it is entire facts that ground and are grounded, or are fundamental facts, whereas it is components of facts—or rather, their corre-

sponding concepts—that are fundamental concepts. Essentialist claims $\Box_{x_1,x_2\ldots}A$ are partially fact-level (A) and partially subfactual ($x_1, x_2 \ldots$). Second, ground is *comparative*, in that grounding claims involve multiple facts (one or more facts are said to ground another), whereas both fundamental concepthood and fundamental facthood are (on my usage anyway) *absolute*: fundamentality is fundamentality simpliciter—absolute fundamentality.[27] Essentialist claims $\Box_{x_1,x_2\ldots}A$ can be regarded as comparative: the natures of $x_1, x_2 \ldots$ are said to give rise to A. However, the relevant facts about the natures of $x_1, x_2 \ldots$ aren't specified in the essential claim; indeed, there is no commitment to any such facts being specifiable. (We will return to this.)

Because it is comparative, there is a sense in which ground is a richer notion than either sort of fundamentality. Ground can be used to make assertions about high-level subject matters, and about how high-level matters relate to the lowest level, whereas (absolute) concept-fundamentality concerns only the lowest level. Moreover, as we saw, fact-fundamentality can apparently be defined in terms of ground, whereas there is no simple definition of ground in terms of fact-fundamentality. Thus the concepts of fundamentality cannot "go it alone" for certain philosophical endeavours. But for certain purposes this austerity of fundamentality can be welcome. Focusing exclusively on what is fundamental might be deemed appropriate if what one is giving an account of is itself a fundamental matter.

This austerity comes with a price. The absoluteness of fundamentality encodes a presupposition: that there is such a thing as an absolutely fundamental level. (It is of course not presupposed that we have knowledge of that absolutely fundamental level.) I defend this presupposition in Sider (2011, section 7.11). (Among other things, I point out that accepting the existence of absolutely fundamental concepts does not require the existence of mereological or spatiotemporal atoms; and I resist the idea that metametaphysical theorizing ought to be neutral about "first-order" metaphysical questions.) Still, the presupposition is a substantive one. Although some of what I will say about absolute fundamentality could be restated using a notion of relative fundamentality, much of it could not.

Let us finally discuss epistemology. How should we form beliefs about what concepts are fundamental?

Realist epistemology of science generally stresses the super-empirical virtues,

[27] I'm open to various concepts of relative fundamentality, but the more fundamental (!) concepts of fundamentality, in my view, are the absolute ones. See Sider (2011, section 7.11).

notably simplicity of various sorts; and simplicity is in my view a central part of the epistemology of concept fundamentality.

One sort of simplicity, call it ideological parsimony, concerns the number and nature of undefined concepts: fewer and "simpler" concepts are better. Another sort concerns laws: a theory is better when it contains powerful yet simple laws, where the simplicity of a law corresponds to something about its syntax when stated using the theory's undefined concepts.[28] Frank Arntzenius's book *Space, Time, and Stuff* is a wonderful recent example of inquiry into the fundamental metaphysics of science that gives pride of place to simple and powerful laws. Arntzenius writes that:

> … our knowledge of the structure of the world derives from one basic idea: the idea that the laws of the world are simple in terms of the fundamental objects and predicates. In particular, what we can know and do know about the way things could have been—what we can know and do know about the metaphysical, and physical, possibilities—derives from our knowledge of what the fundamental objects and predicates are, and what the fundamental laws are in which they figure. I argue that it is bad epistemology to infer what the fundamental objects, predicates, and laws are on the basis of intuitions as to what is, and what is not, possible.
>
> (2012, p. 1)

Notice how distinctively postmodal this is. Modal beliefs—about fundamental reality anyway—are epistemically downstream from nonmodal beliefs about the way reality is, and these nonmodal beliefs should in large part be determined by considerations involving laws (and also ideological parsimony, in my view). This epistemology will play a leading role in Chapters 3 and especially 4.

There are difficult questions about each sort of simplicity. Ideological parsimony is not just a matter of counting fundamental concepts, for instance, nor is simplicity of laws just a matter of measuring the length of their statements. But this is neither unexpected nor worrisome. Like all norms, epistemic norms are a high-level phenomenon, no doubt vague, perhaps somewhat contextual, and perhaps even incoherent in some cases.

Ideological parsimony is "negative", generating reasons against accepting concepts as fundamental. Simplicity of lawhood, on the other hand, is "positive", generating reasons for accepting concepts, when they are needed to formulate simple and powerful laws. There are laws-based negative maxims as well, such

[28] Yet another sort is quantitative parsimony, positing fewer individuals; but in my view this is relatively unimportant. See section 3.14.1.

as not to posit fundamental concepts that aren't needed to state the laws, and not to posit fundamental concepts when simpler and equally powerful laws could be based on alternates, but perhaps these follow from ideological parsimony plus a purely positive simplicity-of-laws principle.

(A further positive epistemic force is not simplicity-based: the requirement that the fundamental concepts be "complete", that we posit enough fundamental concepts to capture all of the phenomena (section 1.7.2). This overlaps the simplicity of laws, insofar as the laws are among "the phenomena". Another epistemic force, which will be important in Chapters 4 and 5, isn't neatly classifiable as positive or negative: avoiding arbitrariness and artificiality. But there is surely more to the story.[29])

Realism about fundamental concepts and simplicity-based realist epistemology of science are made for each other. First, the realist about fundamental concepts is ideally placed to accept a simplicity-based realist epistemology. The ur-idea of this epistemology is that we are a priori entitled to expect the world to be simple. But it is a point familiar from Goodman (1955*a*, chapter 3) that simplicity judgements depend on which concepts are deemed relevant to simplicity; a search for simple laws will lead in different directions, depending on which of 'all emeralds are green' and 'all emeralds are grue' is regarded as more simple. A realist about fundamental concepts recognizes an objective division amongst concepts, on which can be founded an objective simplicity-based epistemology.

Conversely, it's very natural for a realist about fundamental concepts to think that parsimony and simple-yet-powerful laws are epistemically important, provided she's a scientific realist anyway. For the realist about fundamental concepts believes in worldly distinctions corresponding to differences in these kinds of simplicity; and they seem like an exact match for the intuitive basis of realist thinking about theory choice, which is that the world is a priori likely to be simple, or that we are entitled to assume that it is.

It might be thought that only defenders of antireductionism about laws of

[29]For instance, John Hawthorne pointed out that it is unclear whether anything in the epistemology sketched so far counts against the idea that there is a single fundamental concept which completely specifies the nature of the whole universe as it actually happens to be. (I say "unclear" because of the requirement that the fundamental concepts be individually simple, but that is a pretty elusive requirement.) Against this idea I would invoke an additional epistemic principle, a preference for inventories of fundamental concepts that enable a complete account, not only of what actually happens, but also of the space of possibilities for what could happen. See Sider (2008*a*).

nature—such as Armstrong (1983) and Maudlin (2007)—should centre their epistemology on simplicity of laws. Reductionists—like Lewis (1994)—don't think that laws are part of fundamental reality; and why should we expect simplicity in reality's derivative aspects? But this neglects a distinction between *laws* and law*hood*. To illustrate with Newton's dynamics: the law is just the fact that $F = ma$—that is, the fact that F for any object is in fact identical to $m \cdot a$ for that object—whereas the fact about lawhood is that the former fact indeed counts as a law. It is lawhood that reductionists think is metaphysically derivative: $F = ma$ counts as a law because of how this general fact fits into larger patterns (according to Lewis's particular form of reductionism anyway). But the law itself, the fact $F = ma$, is not derivative in this way; that fact concerns fundamental reality just as much for reductionists as for antireductionists. The laws-centric epistemology is as reasonable for a reductionist as for an antireductionist; an a priori bias towards simple patterns is as reasonable as an a priori bias towards simple robust-laws; each is a precisification of the vague bias towards the world being simple.[30]

1.9 Apology

Some of the issues we've begun to discuss will strike some people as being overly "metaphysical", so let me close this chapter with an apology for the place of this sort of metaphysics in the philosophy of science. I myself think that a self-critical version of the "too metaphysical" reaction is important though probably wrong; but an uncritical version is indefensible.

[30]Another threat to the laws-centric epistemology might be thought to derive from Hicks and Schaffer's (2017) argument that fundamental laws need not be about fundamental properties. Newton's dynamical law, for example, is on their view about the nonfundamental property of acceleration. I am inclined to reply that the *metaphysically* fundamental law is not expressed by '$F = ma$', but rather by a more complex statement in which defined quantities like acceleration are replaced by their "definiens", so that only fundamental quantities appear (position, time, mass, and component force, perhaps). But Hicks and Schaffer object that this would be inappropriate meddling with physics; the textbook statement shouldn't be ruled out by a metaphysics of lawhood (sections 3.2, 4.3). I myself don't mind a *bit* of meddling: the metaphysican's conception of the law needn't match textbook statements so long as a reasonable methodology of the former can be given which isn't too detached from empirical methodology. But the issues are complex and can't be settled here. In any case, even if their argument is correct, there is no threat to the laws-centric epistemology, since that epistemology could be understood as merely requiring a bias towards simple statements about fundamental properties, whether or not true statements of that sort count as fundamental laws.

Textbook statements of physical theories are often regarded as not being themselves foundationally adequate. Maybe they include some equations plus remarks about how to use the equations to make predictions, and nothing else. So we try to give a foundational account of the theory, to make clear "what the theory is telling us about the world".[31]

Whether a proposed foundational account is perceived as adequate is highly sensitive to the concepts in which the account is cast—the account's metaphysical tools. The question of what tools are appropriate is often left implicit, but it is itself substantive, central, and difficult. The uncritical reaction I deplore is simply presupposing one particular set of preferred tools without recognizing the substantive nature of the presupposition.

After all, consider someone just digging in and reiterating the textbook statement. 'You ask what Newton's dynamics is saying about the world? That's completely clear: it's saying that $F = ma$; what's the problem?' Here we want to object that this is not yet an adequate foundational statement. But the mere fact that the defender of the textbooks has just reiterated the theory in the original terms is not itself problematic. One can't keep recasting theories in other terms indefinitely.

Foundational accounts often include an explicit statement of the theory's *ontology*. For instance, in the case of classical mechanics we might make explicit the postulation of points of substantival Gallilean space-time and particles occupying that space-time. Here the challenge 'but what is *that* saying about the world' may be met either with bafflement or by simply reiterating the claim: 'well, it is saying that *there are* points of space-time and particles occupying them!'. At some point a statement of a theory is going to have to stand on its own.

Giving a theory's ontology is often considered a paradigm of an acceptable approach to foundations; indeed, many simply assume its acceptability. (Indeed, some seem to use the word 'ontology' to just *mean* 'what the theory says about the world'.) But that assumption is neither trivially correct nor universally shared. David Wallace, for instance, does not regard questions of ontology (such as whether it is three-dimensional space or some very high-dimensional space that fundamentally exists) as inevitably being good foundational ones[32]; and in metaphysics there are the ontological deflationists such as Eli Hirsch (2011)

[31] Clarifying a theory's metaphysics is just one possible goal of a foundational account. Other goals include clarifying its epistemology and what it says about measurement.

[32] See Wallace (2012, e.g. section 8.8). Wallace suggests structural realism as his preferred replacement for the status quo, but I offer him an alternative in section 5.6.1 of this book.

and Amie Thomasson (2007, 2015). According to some such philosophers, apparently incompatible claims about ontology might be nothing more than notationally different ways to get at the same reality. To them, the retort 'what's unclear? I've told you what there is!' is no better than the analogous digging-in of the defender of the textbooks.

According to the defender of the textbook, the concepts used in the textbooks were adequate metaphysical tools; according to the provider of the ontological foundational theory, the concepts of ontology ('there exist…') are adequate metaphysical tools. The question of which metaphysical tools really are adequate is deep, pervasive, difficult, and substantive. A theory stated using adequate metaphysical tools will hook up with what is objectively present in the world. It will not be in need of further metaphysical elucidation. Differences that are stated using adequate tools will be substantial differences, as opposed to "notational" or "merely conventional" differences. One won't have become "too metaphysical", by assuming structure that isn't really there. Thus the question of which tools are adequate is about how much structure reality has—a question that is as difficult and substantive as can be.

My own view is that a foundational theory must specify both a fundamental ontology and also fundamental concepts (including fundamental logical concepts, though this is more contentious and can mostly remain in the background). But the thing I want to stress here is the existence of the issue. Some carry on a dispute that presupposes a certain set of metaphysical tools, without acknowledging the presupposition. Others recoil from metaphysical issues that presuppose a certain set of metaphysical tools, without acknowledging that the recoil is a substantive reaction—why not those tools?—or that they themselves presuppose certain other tools as giving rise to genuine foundational questions. These are all substantive questions—foundational questions presupposing certain tools, and the questions of which tools are the right ones—and should be pursued simultaneously since there is two-way influence between the questions, as I hope to illustrate.