

Grounding and Determination

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Abstract

What does the world consist of? Just as important, what does the world consist *in*? These metaphysical questions concern ontological priority – the matter of what *grounds* what, insofar as its existence and nature is concerned. I suggest that we should treat grounding as an indispensable tool in metaphysics. I argue that we should understand grounding to follow the Determinable-Determinate relation, where only the most determinate properties are apt to be grounds, that is, apt to be fundamental. I mount this view on the back of a heady intuition: *the world isn't vague, but is perfectly determinate*. This intuition, understood as a claim about determinate properties, has several virtues: it allows us to account for the contents of the world, explain how those contents fit together, and it delivers an ontological ordering which is *well founded* – it entails that chains of ontological priority terminate. In the second part of the paper, I defend my view against an alternative proposal from Jessica Wilson, that some determinable properties may also be fundamental. My responses to Wilson's account elucidate the strengths of my own view, specifically that only the most determinate properties properly capture the real, perfectly determinate character of the world.

Keywords

Grounding · Determinable properties · Ontological priority · Priority Monism · Vagueness

Grounding and Determination

I maintain that metaphysics concerns the question of what the world *consists of* and *consists in*, and that we require an answer in terms of *grounds*. When we ask what the world consists of, we are asking after what exists, what the contents of the world are. Thus, it is a metaphysical question to ask, ‘do numbers exist?’ and we should expect a metaphysical answer. Metaphysics also concerns what the world *consists in* – that is, how the contents of the world are structured, and how the fundamental gives rise to the derivative. Thus, along with asking whether something exists, we may ask *how* it exists (Cf. Schaffer 2009b, p348). So, I endorse a thesis of *ontological priority* – the claim that some things exist (or have their being) in virtue of some other things. Jonathan Schaffer and I concur in this regard, and he has undertaken the valuable project of defending the notion of grounding as the primitive concept of metaphysical structure. However, Schaffer aligns grounding with a kind of *mereological* priority in his thesis of Priority Monism.¹ While the agendas of grounding and Monism might well be connected, it seems that certain infelicities emerge as a result. In particular, I believe that Schaffer does not and perhaps cannot argue for *Well-Foundedness* (that chains of ontological priority terminate) sufficiently on his terms. I offer and defend an alternative. I proceed from the deep intuition that the world is not vague – it has a perfectly determinate character. Instead of aligning grounding with Monism, I align grounding with the Determination relation. I argue that the only things which fundamentally exist are super-determinate properties, and that the structure of the world (how the non-fundamental is grounded in the fundamental) is organized according to the relation of Determination. The first part of the paper demonstrates some of the virtues of my theory: following an introductory discussion of grounding and Determination, I will show that if we accept my thesis, then we can answer the problem of Well-Foundedness in an especially convincing way. The second part of the paper demonstrates that my theory lacks the vices some might claim it has: I defend my thesis against certain interesting objections raised by Jessica Wilson (namely, that determinable properties, and not just super-determinate properties could be fundamental).

¹ For example, Schaffer (2003, p500) writes that, “the question of the evidence for fundamentality is best understood as the question: What is the evidence for mereological atoms?”

1. Determination, Grounding, and Well-Foundedness

1.1 Determination

Determination is easily understood by considering paradigmatic cases such as colors.² Consider the color red, and the relation that red bears to a particular shade of red, crimson. In such a case, crimson is the *determinate* property of the *determinable* property, red. At the same level as crimson, so to speak, would be other red-determinates like scarlet and maroon. Determination holds between two properties – one determinate and one determinable – and these relata may form a chain of relative determination. For example, crimson is determinate relative to its determinable, red; but red is determinate relative to its determinable, colored. In this way we see that determinates are specific ‘ways of being’ their determinables. It is perfectly natural to say, for example, that red is a particular *way of being* colored, or that equilateral is a particular *way of being* triangular.

Jimmy: “So is Rocky a heavyweight?”

Joe: ‘Well, sure, but Rocky’s really on the lower end of the scale – a *barely*-heavyweight – coming in at 205lb.’

Determination involves generality and precision, insofar as determinables are more general than the determinate properties which precisify them. This is especially obvious when we consider properties involving numeric values. An electron may have some precise charge, a person will have some precise mass, and a stick may have some precise length. However, we often will refer to the charge, mass or length with the understanding that the numbers used are estimates rather than final values, and we form categories which correspond to these estimates, as with Rocky’s weight. Being a barely-heavyweight determines (precisifies) being a heavyweight; and both are determined by Rocky’s actual weight of 205lb.

Note that the notion of a ‘way of being’ is intended to constrain Determination according to *determination dimensions* of the property. For example, *weighing*

² I have used colors as my examples, since they are the stock examples in the literature on Determination. I have assumed that colors are determined according to the dimensions of hue, saturation, and brightness (i.e., one may distinguish colors along these dimensions). Nothing very significant turns on my choice of examples. Even if it turns out, say, that primary red is not super-determinate, the principles in my analysis remain quite unchanged.

205lb and having bad hair is not a determinate of weighing 205lb. Why? Weighing 205lb and having bad hair is not a ‘way of being’ 205lb, since having bad hair does not further determine or precisify the weight. Allow me to import Eric Funkhouser’s (2006) useful term, to which I have referred already: a property is *super-determinate* if it does not admit of further determination. For example, it is plausible that primary red is a super-determinate property, since there is no further way of determining it.³

From the examples we arrive at a slightly more formal characterization of Determination. It is a two-place relation held between properties, and it is asymmetric, transitive, and irreflexive.

Asymmetric: Red determines colored, but colored does not determine red (red is a way of being colored, but being colored is not a way of being red).
 $(\forall x)(\forall y)(Dxy \rightarrow \neg Dyx)$

Transitive: If scarlet determines red, and red determines colored, then scarlet determines colored (scarlet is a way of being colored).
 $(\forall x)(\forall y)(\forall z)(Dxy \& Dyz \rightarrow Dxz)$

Irreflexive: Red doesn’t determine red (nothing determines itself). $\neg(\exists x)Dxx$

The most interesting feature of Determination is not a feature of the relation so much as it is a feature of the way the relation applies to the world: *objects are perfectly determinate*. If an object instantiates a determinable property, it must also instantiate some determinate property under that determinable.⁴ For example, it is not possible that a shirt be blue *simpliciter* – there must be some perfectly determinate shade of blue (say, royal blue) which the shirt is.⁵ This feature is the cornerstone of my argument for Well-Foundedness.

1.2 Grounding

Grounding concerns metaphysical structure: it assists our inquiry into what the world consists of, and what the world consists in. Grounding is a relation of ontological priority: it governs how existence (or being) is ordered, where that which is ontologically derivative *depends on* that which is ontologically prior.

³ For this introductory exposition, I am indebted to Armstrong (1997), Crane (2008), and Funkhouser (2006). They in turn have acknowledged their debt to each other and to the original discussion in Johnson (1921).

⁴ See Funkhouser’s (2006, p 549) criterion three.

⁵ Cf. Armstrong (1961, p59): “It makes no sense to say that a physical object is light-blue in color, but is no definite shade of light blue.”

Where x grounds y , we say that y depends on x , and that x is prior to y . The sense of priority is not chronological, but rather ontological: it concerns (i) the existence and (ii) the nature of the entity. So, where x grounds y , we say that y ontologically depends on x , in the sense that y depends for its existence and its nature on x . Grounding is also an explanatory notion: where x grounds y , we may say that x explains y in the sense that it explains the existence and nature of y .

The grounding relation has the same logical structure as Determination – that is, it is a two-place relation which is asymmetric, transitive, and irreflexive. This logical structure allows for chains of grounding, in which one relatum is more *fundamental* than the next, which may in turn be more fundamental than some other. This informs the notion of relative fundamentality. However, some things may be *absolutely* fundamental – things such that they depend on no further things for their existence. The totality of ultimately fundamental things are sufficient for the complete contents of the world, since the existence of the fundamental things guarantees the existence of the derivative things. In getting a grip on how the world is composed, we might well ask, ‘what did God need to create in order to create the world?’ To this, it will be answered: God needed to create *all and only the fundamental components*, since the existence of fundamental components necessitates the existence of everything else (and God, knowing all, does not labor any more or less than required). On this picture, given that the fundamental components are accounted for, the world is *Complete*.

1.3 Well-Foundedness: Solutions in Determination?

Could there be turtles all the way down? Could chains of ontological priority regress without limit to ever more fundamental entities, or must they find some absolutely fundamental ground? We join Schaffer (2003) in asking “is there a fundamental level?” In other words, must all priority chains terminate? Our intuitions to this question advise an affirmative reply. Following Schaffer’s (2010, p37) terminology, this is the intuition that ontological chains are *Well-Founded*. For our purposes, we shall say that an ontological relation R is Well-Founded where all ontological priority chains governed by R terminate (have some relatum which is an ultimate terminus); Well-Foundedness is not satisfied otherwise.⁶

⁶ So for the relation to be non-Well-Founded it is sufficient that there is at least *one* infinitely descending chain (i.e., it is not necessary that *all* of them descend infinitely).

Schaffer (2010, p37) offers a useful analogy from foundationalism in epistemology, since the epistemic foundationalist is similarly committed to the termination of the chain of justification in some basic level, and she will reject infinite or circular justification. Likewise, there is something unnerving about the prospect of infinitely descending or circular chains of grounding. Schaffer (2010, p62) sums up this intuition in the pithy claim, “[b]eing would be infinitely deferred, never achieved.”⁷ I believe that the intuition of Well-Foundedness arises just as soon as we accept the notion of ontological priority (that existence or being is subject to a hierarchical ordering). My own intuitions follow this argument: Assuming ontological priority, if there were no fundamental level, then there would be no subsequent levels of being. However, there obviously are subsequent levels of being (here is one hand, and here is another).⁸ Therefore there must be a fundamental level.

I think this is a good argument. Furthermore, I share the intuitions and appreciate the analogies that Schaffer elicits. So, I take us to have reason to require that our thesis of grounding delivers a Well-Founded ontological order. Now, Schaffer thinks he can secure Well-Foundedness best through the thesis of *Priority Monism*. Priority Monism holds that ontological priority tracks mereological relations (the priority relations between parts and wholes). It is *monistic* in the sense that it maintains that the whole is prior to its parts. It is contrasted with *Priority Pluralism*, which holds that the parts are prior to the whole. Priority Monism and Pluralism are taken to be exclusive and exhaustive, and to hold with necessity: one and only one of Priority Monism or Pluralism is true, and it is necessarily true. According to Schaffer’s Priority Monism (2009a, §3), there is a *single fundamental entity*, the cosmos (the maximal concrete whole). All other objects (tables, people, electrons) are parts of this whole, and so are ontologically posterior to it. According to Pluralism, there is *more than one fundamental entity* (so it follows that the cosmos is not fundamental). One sensible form of Pluralism is atomism,⁹ which holds that simples, the ultimate parts, are fundamental. Correspondingly, everything else ‘grows out of,’ and is thus grounded in, these simples.

⁷ Schaffer elsewhere follows this up with a further helpful analogy: “By way of analogy, consider the parable of all God would need to do. Without ontologically basic entities, there would be no sense to such a parable. What would God need to do, to create a baseless world? Where could He begin?” (2009a, §3.1).

⁸ Cf. Moore (1939)

⁹ Indeed, Schaffer (2010, §2.4) takes atomism to be the only serious Pluralist contender.

Well-Foundedness and the possibility of gunk are the keys to Schaffer's argument for Priority Monism.¹⁰ Could there be gunky worlds? That is, could there be worlds every part of which has proper parts? Schaffer (2010, p61) thinks that gunky worlds are certainly possible, since they are conceivable and "scientifically serious." In a gunky world, there are no simples. And if there are no simples, then the (atomist) Pluralist lacks a Well-Founded ontological base; so Pluralism must be false in that gunky world. The falsity of Pluralism implies the truth of Monism, so Priority Monism is true in that gunky world. But these are modally powerful theses – if they are true at all, they are *necessarily* true. Therefore, Priority Monism is necessarily true.

I deny this conclusion because I reject the dichotomy from which it is derived. I reject Schaffer's key premise that ontological priority tracks the part-whole relation (in either the Monist or the Pluralist direction), and I reject that objects are apt to be fundamental.¹¹ I contend rather that *ontological priority tracks the relation of Determination*, and that *only super-determinate properties are apt to be fundamental*. My view has the virtue that it makes good on our intuition that ontological chains are Well-Founded, as I will show. I argue that *Precision* (the world is perfectly determinate) and *Properties* (*Precision* is to be understood as a claim about properties) yield the conclusion that there are Super-Determinate properties. This conclusion, combined with the foregoing discussion about grounding and Determination reveals that super-determinate properties form the fundamental base of a Well-Founded order of ontological priority.

Precision

My intuition is that the world is not vague, but is perfectly precise. While we might imagine that some of our concepts and linguistic devices are vague, imprecise, or indeterminate, *the world itself*, by contrast, is perfectly determinate. Many share this intuition,¹² gaining purchase on the notion of determinacy in the world by considering its counterpart – vagueness in concepts. Williamson (2001, p248) writes: "vagueness is often said to be a feature, not of objects themselves, but of the words with which we describe them.

¹⁰ Schaffer (2009a, p32): "Modally, mereology allows for the possibility of *atomless gunk*, with no ultimate parts for the pluralist to invoke as the ground of being."

¹¹ Schaffer (2010, p36) acknowledges that "it may be controversial to allow for priority relations between actual concrete objects. One might allow that there are priority relations between, say, *properties* but refuse to extend the notion of priority further." In this respect, I take the less controversial route.

¹² Copeland (1994, p83) sums up the prevailing attitude to ontic vagueness: "This notion that the world in itself might be vague strikes me as a particularly dark piece of metaphysics."

The intended thought is Russell's: objects are vague only in their capacity as representations." Likewise, Lewis (1986a, p212) suggests that "[t]he only intelligible account of vagueness locates it in our thought and language... Vagueness is semantic indecision." Consider the height of the Eiffel Tower. We might not be able correctly to ascribe some definite number to its height, since our units of measurement might be refined indefinitely. However, this is no defeater to the claim that the tower itself has a determinate height.¹³ The indeterminacy lies in our linguistic apparatus or epistemic shortcomings, not in the object itself (*de re*). There is no ontic vagueness.¹⁴

Now, I have said that the world is perfectly precise, but this is possibly misleading. There is a sense, as Russell notes, that such talk involves a sort of category mistake. To describe the world as 'precise' is seemingly to imply that it could be made more precise or less precise (just as representations may be made more or less precise).¹⁵ In the case of the world, this is obviously incorrect: "Things are what they are, and there is an end of it. Nothing is more or less what it is" (Russell 2003, p213). I agree with this claim: the nature of the world is independent of our characterizations of it, and its nature is whatever its nature is. Our job in metaphysics is getting at the nature of the world in terms which "carve it at its joints," to use Ted Sider's (forthcoming) felicitous phrase. Sider's phrase helps us to get a grip on the intuition that the world itself is perfectly precise, and that we may refer to it in more or less precise terms. So will persist in referring to the world as *perfectly determinate* or *perfectly precise*, these

¹³ Cf. Armstrong (1961, p59): "A physical object is determinate in all respects, it has a perfectly precise color, temperature, size, etc."

¹⁴ Cf. Barnes (2010, p601): "The idea of ontic vagueness is in one way very simple – it's vagueness in the world, vagueness in what there is as opposed to our descriptions or knowledge of what there is. But glosses like this don't do much more than frame the concept, and they'll do little to appease the prevailing worry that ontic vagueness is somehow mysterious, or even *unintelligible*."

¹⁵ For Russell (2003, p213) this is to commit "the fallacy of verbalism – the fallacy that consists in mistaking the properties of words for the properties of things. Vagueness and precision alike are characteristics which can only belong to a representation, of which language is an example. They have to do with the relation between a representation and that which it represents. Apart from representation, whether cognitive or mechanical, there can be no such thing as vagueness or precision." Also consider Sider's (2003, p137-8) two arguments against vague existence, which commence with the premise "vagueness requires precisifications. Wherever there is vagueness (of the type relevant to the argument, anyway), there must be different non-vague candidate meanings 'in the neighborhood of' the vague term."

Russellian scruples notwithstanding: all I mean is that the world is such that it contains no vagueness, and it cannot be precisified.

I hope you share the intuition that the world itself is not vague. Those who do not share my intuition will perhaps be persuaded by the Evans-Salmon argument(s) or Katherine Hawley's interesting alternative, all of which demonstrate that there are no vague objects.¹⁶ While not everyone is convinced of this intuition, many objections to it do not touch the core on which my argument here depends. For example, some think that ontic vagueness (vagueness in the world) may be a consequence of quantum indeterminacy, or fuzzy objects across time. My claim is that the world is perfectly determinate in that it has a nature which is independent of our imprecise descriptions of it. Understood this way, the intuition is not easily threatened by quantum indeterminacy or fuzzy objects across time – both are perfectly consistent with it. For example, it might be indeterminate whether Tibbles the cat at t_1 is still Tibbles at t_2 . However, there is nothing vague in the data, for example, that at t_1 there are perfectly precise particles arranged (perfectly precisely) like this, and at t_2 there are perfectly precise particles arranged (perfectly precisely) like that.¹⁷ Many seemingly vague items may be given a perfectly precise description, typically revealing that the vagueness lies not in the world but in our relatively imprecise descriptions or representations of it.

¹⁶ The Evans-Salmon argument ((Evans 1978) and (Salmon 1982)) proceeds via reductio to show that the assumption of ontic vagueness (articulated as: it is indeterminate whether x is identical to y) cannot be sustained without contradiction. Hawley's (2004, p120) recent contribution proceeds more directly, and concludes that "whenever there is a respect in which it is indeterminate whether two objects differ, then there is a respect in which they differ, and it is therefore determinate that the two objects are not identical."

¹⁷ Cf. Sanford (2009, §8): "If things in the world are absolutely determinate, this presumably does not require that any absolute determination persists through the passage of time or space. If a cumulus cloud changes continuously in shape and size, this does not by itself preclude its having, at any one time, an absolutely determinate shape and size."

Properties

How shall we understand the intuition that the world is not vague? I think it is a claim about the kinds of *properties* that there are in the world. I draw this link between the Determination relation and the intuition of Precision: *the claim that the world is perfectly precise just is the claim that nothing may instantiate a determinable property simpliciter, but must instantiate some super-determinate property which falls under it.* Vagueness in the world is easily understood as a claim about determinate properties, and claims about the one blend seamlessly with claims about the other. For example, Johnson (1921, p185) writes, “the practical impossibility of literally determinate characterization must be contrasted with the universally adopted postulate that the characters of things which we can only characterize more or less indeterminately, are, in actual fact, absolutely determinate.”¹⁸ While we may refer to Rocky as a heavyweight, or a barely-heavyweight, or whatever, there is some absolutely determinate way Rocky’s weight is.

Once it is intuitively agreed that the world is perfectly precise, then one proceeds to the analysis of this claim. Some initially analyze the claim as a claim about objects. While generally correct, more accurately it is a claim about the sort of *properties* which objects instantiate. The precision of Rocky consists in the precision of the properties he instantiates. In this vein, Hawley (2004, p109) offers the following helpful characterization of vagueness in the world:

What else could it be for an object to be vague except that it be indeterminate whether it has a certain property, or indeterminate whether it bears a certain relation to a certain other object? And what else could it be for a property or relation to be vague except that it be indeterminate whether that property or relation is instantiated by certain objects?

It is my contention that the simplest way to cash out determinacy in the world is through determinacy in properties. This leads to the claim that the precision of the world is a function of the existence of super-determinate properties. Here is a simple argument involving the moves from the absence of vagueness in the world to the instantiation of super-determinate properties:

¹⁸ Sanford (2009, §8) suggests towards the end of his SEP article that he is unconvinced of Johnson’s postulate, arguing briefly that it is incompatible with some aspects of physics. I am disinclined to accept Sanford’s claims, since the portions of physics in question seem to me to commit Russell’s “fallacy of verbalism.”

1. The American flag has *red* stripes.
2. If the stripes were *red* *simpliciter* (i.e., the stripes instantiate some determinable property but no ultimately determinate property) then it would be indeterminate whether they are, say, scarlet or crimson or maroon etc. (i.e. which determinate way they are *red*).
3. If it were indeterminate whether the stripes are scarlet or crimson or maroon etc. then there would be an indeterminate object in the world (we could not say whether the stripes were or were not in the extension of crimson, for example).
4. There are no indeterminate objects in the world.
5. So the stripes are not *red* *simpliciter*.

By iterating this argument, we reveal that it does not proceed to *reductio* only where the starred property is not held *simpliciter*, but is super-determinate (cannot be determined any further) – say, where the property is flag-red. Thus we may conclude that there are super-determinate properties. Most importantly, this argument is intended to demonstrate that the requirement that the world is not vague is a requirement that the properties in the world be fully determinate.

Now, if we agree that the world is fully determinate, and that this is a claim about the kinds of properties that exist in the world, then Well-Foundedness is a short step away. I claim that super-determinate properties (like flag-red, spin of 0.5, mass 1lb, etc.) are fundamental. Why? Super-determinate properties *do the work of grounding*: they account for the nature and existence of the contents of the world, and they do so in an explanatory way. If asking, ‘how shall we build the world?’ we can give our answer in terms of super-determinate properties. Super-determinate properties guarantee the existence of the world’s complete contents: super-determinate properties determine – and thus necessitate the existence of – all of the derivative properties.¹⁹ Recall the aphorisms of supervenience: ‘fixing the base properties fixes the supervenient properties’, and ‘no change in the supervenient properties without a change in the base properties.’ Such slogans help us to get a grip on the way super-determinate properties *fix the character* of the world. How does God make the stripes of the American flag red? He must make them some super-determinate shade of red (flag-red). What *makes it true* that the stripes are red? The stripes instantiate the super-determinate property flag-red. What *explains* their redness (and, transitively, their coloredness)? The

¹⁹ I assume that one can give an ultimate catalogue of the world in terms of properties. This is not to say that I believe objects do not exist: all I hold, more plausibly, is that if one catalogues all the properties, then one will *ipso facto* have catalogued all the objects.

fact that they are flag-red, and flag-red stands in the relation of Determination to red and transitively to colored. In the language of creation, all God needed to do to create the complete contents of the world was to create the super-determinate properties.

Return now to the requirement that orders of grounding be Well-Founded. Schaffer pointed out that Well-Foundedness is a common and deep intuition. I agree with this, and I proposed a short argument supporting this requirement. Monism has the virtue, Schaffer claims, that ontological priority is Well-Founded. That is, if the cosmos – the maximal whole – were the lone fundamental entity, then there would be no indeterminate chain of grounding. He contrasts Monism's success with Pluralism's failure in the possibility of gunk. Schaffer (2010, p62) writes:

If the world is gunky, that's the way the world is. It is such that every part of it has proper parts. Likewise if the world is atomistic, that's the way the world is. It is such that every part of it has ultimate parts. Likewise if the world contains a mixture of gunk and atoms, that's the way the world is. It is such that some parts are such that every part of them has proper parts, and some parts are such that every part of them has ultimate parts. The monist can handle any possibility.²⁰

But Monism is not the only way to get a Well-Founded ontological ordering; another way is to endorse my thesis that only super-determinate properties are fundamental. I think that Schaffer has hitched his wagon to the wrong star: The stronger intuition is not Monism but *Precision*. Schaffer would have done better to latch onto the sense that the world has some perfectly determinate nature independent of our descriptions of it and “that's the way the world is.” On the assumption that the world is perfectly determinate, we derive the claim that for any instantiated property, it must be instantiated to the super-determinate level. This leads swiftly to the conclusion that super-determinate properties exist *if anything does*. This is precisely what we should expect from *fundamental* entities – they exist if anything does. Furthermore, as discussed above, super-determinate properties do the work of grounding (transitivity, entailment, completeness, explanation etc.). So, I conclude that super-determinate properties are fundamental, and that grounding follows Determination. Are Determination chains Well-Founded? Yes; necessarily so. *Determination chains have their base in the way the world is*. Whichever properties (spin, mass, charge

²⁰ I remain skeptical that the Priority Monist can properly handle the prospect of *junky* worlds.

etc.) the world happens to have, those properties are super-determinate: they are perfectly precise, joint-carving, and they ground the determinable properties under which they fall. The world cannot be precisified. That is, the instantiated properties cannot be determined any further. This is true of gunky worlds, junky worlds, worlds with simples, and worlds without them: none of these configurations disrupt the claim to Well-Foundedness, since they all hold that there is some perfectly determinate way the world is. My thesis delivers a Well-Founded order of ontological priority: the Determination chain is Well-Founded because the chains have their final terminus in the perfectly precise character of the world.

2. Challenges to super-determinate grounding

Jessica Wilson presents arguments which mostly harmonize with mine here. She agrees that ontological priority may be ordered according to Determination. Where she and I diverge, however, is a matter of *where we locate the fundamental*. My thesis holds that only super-determinate properties may be fundamental. My argument is threatened, therefore, by the claim that certain *determinable* properties are fundamental too. Jessica Wilson (2010, p18) argues for precisely this claim, that determinable properties form part of the “fundamental base” of the world. She defends this thesis on the strength of three apparently compelling claims: (1) determinable properties seem real, are modally powerful and entail determinate properties, (2) determinable properties feature in laws of nature, and (3) determinable properties feature in the special sciences. In each case, I affirm most of the data and intuitions Wilson adduces in support of her claim, but I show that this data does not license the conclusion that any determinable properties are apt to be fundamental. My sustained objection is that determinable properties are not fundamental since they cannot do the work of grounding. Wilson’s objections, because they are often both intuitive and theoretically challenging, offer me a useful rubric for articulating my thesis in my responses to her.

2.1 The reality and power of determinable properties

The reality of determinable properties

Why think that some determinable properties are fundamental? One answer is that such properties seem *real*. Questions of fundamentality are difficult to extract from questions of *real* existence, where arguments for the one may seem to be arguments for the other. Nevertheless, there *is* a distinction: my hands exist, but they are not fundamental. I believe Wilson does not attend sufficiently

to this distinction. Wilson (2010, p12) correctly registers the intuition that “[o]n the face of it, there are determinable entities.” I share this intuition. There certainly *do* seem to be determinable entities, and we see this when we consider that we often reason, organize the world, and conduct causal analyses in terms of determinable properties. I perfectly well understand the proposition that *red* roses are my wife’s favorite, and I can very well act in accordance with this determinable property. When at the store choosing roses, I will direct my attention to the redness of the roses, and I will ignore which determinates of red happen to be involved. Such super-determinate precision is seemingly irrelevant to my decision in this case. Furthermore, the redness of the rose (rather than the determinate scarlet, say) seems *causally* relevant:²¹ it seems the redness (*simpliciter*) of the roses will make my wife pleased. To this extent, the super-determinate shade of red is apparently irrelevant to our causal analysis. This reveals, perhaps, that determinable properties are *real*.

I agree with all of these observations – that we successfully reason, organize the world, and conduct causal analyses in terms of determinable properties. I agree, furthermore, that this may motivate a forceful argument for the claim that determinable properties *exist*. Certainly, if someone were skeptical about the real *existence* of red, I think he might have a difficult time arguing against the above points, since these points seem to show that red is something in the catalogue of the world as much as tables or chairs. However, the question in which I am interested is not ‘what exists?’ but rather, ‘*what is fundamental?*’ The foregoing observations about determinables address the former but not the latter question.

Indeed, all of the foregoing observations are compatible with my thesis that only super-determinate properties are fundamental. In claiming that only super-determinate properties are fundamental, I hold that they are the properties which are *ontologically basic*, and which ground the existence of the derivative determinable properties. Now, there is this important connection between what is fundamental and what exists: *if something is fundamental then it exists*. So in claiming ontological priority for super-determinates, I claim that *at least* the instantiated super-determinate properties really exist. However, this plainly leaves open the possibility that other, non-fundamental things may exist. The question of the *real* existence of derivative entities is a matter left to one’s

²¹ For the purposes of this paper, at least, I do not wish to concede anything more than causal *relevance* to determinable properties, since I take seriously the causal exclusion problem articulated by Jaegwon Kim (1998). However, I am tempted by the solutions proffered by Karen Bennett (2008) and Stephen Yablo (1992).

ontological conscience – whether one intends to be ontologically parsimonious, or ontologically permissive.²² I am inclined to think that some determinable properties do exist in some full-blooded sense. However, this is a distinct question from the one at hand – I am concerned primarily with fundamentality! – and I will not address it further here. This much is clear: showing that determinable properties exist is insufficient to show that they are fundamental, since one may affirm the former but not the latter proposition.

The power of determinable properties

Wilson contends that determinables are modally powerful, and may do all the entailment that is required of an item in the world's fundamental base. She argues (2010, p14) as follows:

The argument from asymmetric entailment can also be resisted. To be sure, instances of determinables do not entail any particular instances of their associated determinate instances. But, as in our paradigm cases, they do entail some or other instance of a determinate. In that case, there is a two-way entailment: every instance of a determinate entails an instance of an associated determinable, and every instance of a determinable entails an instance of some associated determinate.

Wilson is correct that there is a degree of mutual necessitation between determinables and determinates, and she articulates this seldom-considered and important point especially well. Again, however, I believe that this does not license the conclusion that determinable properties may be *fundamental*. Determinable properties sustain a sort of necessity and entailment, but it is not the sort of necessity required for *grounding*. An analogy is instructive. Consider the necessity that holds between members and their singleton sets, as in Kit Fine's (1994) useful example involving Socrates and the singleton set {Socrates}. Certainly, any world in which Socrates exists is one in which {Socrates} exists; and any world in which {Socrates} exists is one in which Socrates exists; the existence of either one necessitates the existence of the other. However, Fine's example demonstrates that necessitation (and perhaps modality in general) is not sufficiently sensitive to *ontological priority* – and it is the latter notion we are concerned with here. That is, we don't wish to know merely whether Socrates and {Socrates} are joined by necessity, but rather which is ontologically prior. We wish to know, *in virtue of what* does {Socrates} obtain? In answering this, we

²² For example, Schaffer (2009b, p353) writes that "[t]o reach the sort of neo-Aristotelian position I am recommending one must (i) extend the priority-in-nature ordering to all entities, and (ii) be permissive about the abundant realm of derivative entities."

see that Socrates asymmetrically grounds {Socrates}: Socrates is ontologically prior.

Another way to see that determinable properties could not function as grounding entities is to attend to the *explanatory* role that grounding is meant to fulfill.²³ Fundamental entities must answer *in virtue of* questions about that which they ground: if x grounds y , then x should explain why y obtains. In other words, it is sensible to say that y exists *because* of x . Let's attend to Wilson's claim: given that red entails some determinate of red, does red *explain* why this entailment holds? No. In the case of red we are not told why (e.g.) scarlet obtains, because we are not even told *that* scarlet obtains! It is true that every instantiated property is instantiated to the super-determinate level. However, there is no telling *which instance* of red we get – only that we must have *some instance or other*. This inadequacy bears out my key point: no determinable property is sufficient for the truth of its determinate. This is helpfully compared to the fact that no *disjunction* is sufficient for the truth of one of its disjuncts.²⁴ Since the world has a perfectly determinate character, determinable properties *qua* determinable properties necessarily fail to reveal what character that the world *actually* has. Contrast this with the explanatory power I claim for the super-determinate property, scarlet. This super-determinate property does the work of grounding: it answers the *in virtue of* question, with the appropriate *because* sort of answer. It makes sense to say that red exists *because* scarlet does, since for something to be scarlet is for it to be red in some particular way. This bears out the converse point that super-determinate properties are sufficient for the truth of their determinables (and, similarly, the truth of a disjunct is sufficient for the truth of its disjunction).

2.2 Determinable properties and laws of nature

Jessica Wilson (2010, p219) argues that since determinable properties feature in laws of nature, they are apt to form part of the fundamental base:

[O]n the face of it the laws of physics really are general, in expressing relations between determinables: mass, energy, force, and so on. As Feynman puts it when discussing “these rhythms and patterns which we call physical laws”, such laws

²³ Cf. Lowe (2009, §3): “‘because’ is asymmetrical, because it expresses an *explanatory* relationship and explanation is asymmetrical.”

²⁴ For example, [A or B] is insufficient for A. However, A is sufficient for [A or B].

concern “only the most overall general qualities of nature” (Lecture 1, Cornell University, 11/9/64).

Laws of nature certainly are *stated in general terms*, typically involving universal quantification (e.g. Newton’s first law of motion: *every* body remains in a state of rest or uniform motion (constant velocity) unless acted upon by an external unbalanced force). These laws seem to be insensitive to the precise super-determinate properties, and seem to trade only in more general determinable properties. The defender of determinable properties takes this to be reason to believe that determinable properties are fundamental: What better claim to fundamentality (the structure of reality) could determinable properties have than that they figure in *laws of nature* (the laws which govern reality)?

I think this claim may be resisted, however. Laws of nature, though they are *formulated* as holding between determinable properties, actually hold between super-determinate properties. Though I will not argue in detail for this claim here, I will briefly sketch the view of laws of nature which I think is correct and which recommends my thesis that only super-determinates are fundamental. *What are laws of nature, and how are they grounded?* Laws of nature are generalizations, and they are grounded in their instances. The view that laws of nature are generalizations has an illustrious history commencing with Hume, after which the mantle was taken up with increased sophistication by Mill,²⁵ Ramsey and Lewis.²⁶ The salient underlying thesis, as Lewis (1986b, ix) writes, is this: “all there is to the world is a vast mosaic of local matters of particular fact, just one little thing and then another.” As Mumford (2004, p9) correctly notes, “many people support [the Mill–Ramsey–Lewis theory] view of laws,” and take “laws to be axioms (or theorems) of the best possible systematizations of the world’s total history, where such a history is a history of events or facts.” I

²⁵ Mill’s (1904, Bk III, Ch IV, Sec 1) articulation is strikingly clear: “What are the fewest and simplest assumptions, which being granted, the whole existing order of nature would result? Another mode of stating it would be: What are the fewest general propositions from which all the uniformities which exist in the universe might be deductively inferred?” Ramsey’s and Mill’s influence on Lewis’ (1973, p73) formulation is plain: “a contingent generalization is a *law of nature* if and only if it appears as a theorem (or axiom) in each of the true deductive systems that achieves a best combination of simplicity and strength. A generalization is a law at a world i , likewise, if and only if it appears as a theorem in each of the best deductive systems true at i .”

²⁶ My presentation of the Mill-Ramsey-Lewis view is slender here. An extended discussion of the status of laws of nature should note, for example, that Lewis holds that the laws do not merely describe the facts of the world, but laws themselves are part of the ideal system.

endorse the essence of this view, and it supports my thesis here. *Laws of nature do not come prior to the features of the world, but are rather posterior to them.* The content of a law of nature is given by, or grounded in, the features of the world: Laws are those axioms which appropriately comprehend these features in the world. The features of the world, as discussed, are absolutely determinate. Laws, although general (thus not specific), are theoretical abstractions *out of* these perfectly determinate features. As a toy example, the ‘law’ that all rubies are red is an abstraction out of the set of facts {this ruby is red; that ruby is red} and so on. The direction of grounding runs from the world to the laws: laws of nature are grounded in and therefore *ontologically posterior to* the super-determinate instantiated features. Laws of nature, as generalizations, are like averages: they are grounded in the instances which they comprehend. So, while laws of nature are evinced in terms of determinable properties, the laws are based in, derived from, and hold between, super-determinate properties.

2.3 Determinable properties and the special sciences.

Wilson (2010, p5) writes:

[M]any special science entities appear to be determinable in the relevant sense, in having ontological characterizations that are less specific than (in omitting certain details of) the lower-level entities that compositionally realize them.

Wilson again is quite correct in her observations: the special sciences trade in determinable properties as a matter of course. Many examples are forthcoming: geological properties like cretaceous, biological properties like dilated or enlarged, and over-the-counter terms like cold or tepid, are all determinable properties. Such properties are highly useful to practitioners in the special sciences. For example, it is preposterous to ask a cardiologist to dispense with the property of *enlarged* on the grounds that it is a determinable property, so that he should prefer perfectly determinate properties like *has surface area at t2 which is 17% greater than its surface area at t1*.²⁷ This would render the cardiologist’s work quite unmanageable. Some determinable properties may indeed seem *indispensible* to the special sciences: if we eviscerated the field of biology of all its determinable properties, replacing them with superdeterminate physical properties, then we would cease to have a science of biology in anything like its present form. But surely biology and biological terms as they stand are

²⁷ This long-winded property may not in fact be fully determinate, but I assume the idea is clear.

legitimate! Indeed, the defender of determinable properties may attempt to draw on the Quine-Putnam (Quine 1980, and Putnam 1979a and 1979b) indispensability argument for mathematical realism: since some determinable properties are indispensable to our scientific practices we should take them to be real.²⁸

Again, however, this objection does not touch my central claim. I may agree with the claim that the determinable properties to which the special sciences refer actually exist, but deny that they are *fundamental*.²⁹ The premises of the argument (that the special sciences refer to determinable properties in their theories and causal analyses, and might not be able to proceed as well without them) may support the conclusion that such determinable properties *exist*, and for many of the same reasons that we take tables and chairs to exist. Yet I insist that the conclusion Wilson hopes to draw – that determinables not only exist but are *fundamental* – is not licensed by these observations.

Conclusion: Which properties could be fundamental?

I have responded to Wilson's specific objections with fairly specific responses. However, at the heart of my responses there is a systematic objection to the very possibility of determinable fundamentality. I offer a few further examples which clarify what I find unsettling about determinable fundamentality, and close with a *reductio* of the notion which reveals the source of this discomfort.

I claim fundamentality for only super-determinate properties; consequently I deny that determinable properties are fundamental. Importantly, however, my claim does not proceed by arguing that this-or-that super-determinate property is fundamental, and this-or-that determinable property isn't. Rather, my claim is that super-determinate properties are the only *sort* of properties which could be fundamental, and that determinable properties are altogether the wrong *sort* of properties to be fundamental. My claims are motivated by the persistent and pervasive intuition that the world is perfectly determinate. I focus on the connection between this claim and the Determination relation. The assumption

²⁸ I suspect Quine and Putnam may not have endorsed the extension of their arguments to the special sciences, and presumably much more needs to be said to distinguish *real indispensability* from merely *practical* indispensability. Nevertheless, this strikes me as an interesting move a defender of determinable fundamentality may wish to make.

²⁹ Cf. Quine (1981). Quine will have something to say here concerning the *reducibility* of the special sciences to physics, and the implications of this reduction for fundamentality.

of worldly determinacy undergirds the common claim that properties are instantiated to the most determinate degree. This in turn has the consequence that super-determinate properties exist if anything does. This on its own would not be enough for my claim that super-determinate properties are fundamental. For super-determinate properties (or anything else) to be fundamental, they must *do the work of grounding*: among other things, they must obey the right logical structure, guarantee the existence and nature of the contents of the world, and do so in an explanatory way. I have argued that considerations of the nature of Determination and Grounding support just this claim. Super-determinate properties make for the ultimately determinate character of the world.

These same considerations count against the thesis that *determinable* properties could be fundamental. Return to the intuition of Precision, the claim that the world is not vague but perfectly determinate. As Collins and Varzi (2000, p1) write,

A plausible thought about vagueness is that it involves a form of semantic incompleteness. To say that a predicate is vague is to say (at the very least) that its extension is incompletely specified. And where there is incomplete specification of extension there is indeterminacy—an indeterminacy between various ways that the specification of the predicate might be completed or, as some like to say, *sharpened* (or precisified).

Considerations of vagueness tell against determinable fundamentality in at least three interrelated ways: determinable properties (i) cannot fix the character of the world, (ii) cannot sufficiently individuate the world, and (iii) they cannot entail the complete contents of the world. In all of these respects, super-determinate properties succeed where determinable properties fail. It is a requirement of grounding that *fixing the fundamental fixes the character of the world*. How do you give the world its contents and its character? You create all and only the fundamental entities. Suppose that God had the goal of giving the world a particular feature, say, giving it a particular mass. How would he do so? There is one and only one way – He would have to fix the super-determinate properties. Since mass is super-determinate, if God fixed the super-determinate properties, God would guarantee that the world has the character he wishes it to have. Most importantly, *no distribution of determinable properties could offer this guarantee*.

Determinable properties do not fix the character of the world, since they are by their very nature indeterminate, that is, compatible with a range of distinct determinations, and always capable of being precisified. In this sense,

determinable properties are *disjunctive*. Saying that a determinable property obtains is to say that one of a disjunctive set of determinate properties obtains. For example, saying that my shirt is red is to predicate the disjunction [scarlet or maroon or crimson etc.] of my shirt. However, no determinable is sufficient for the truth of its determinate, just as no disjunction is sufficient for the truth of one of its disjuncts. Perhaps my shirt possesses the disjunctive property of being [scarlet or maroon or crimson etc.], but it is absolutely implausible that my shirt possesses such a property *fundamentally*. Fundamentally, at the level of the ultimately instantiated properties, my shirt is scarlet, or my shirt is maroon, or my shirt is crimson, and so on. Saying that the shirt is red tells me that the shirt is *some or other* determinate shade of red, but it does not tell me which. Determinable properties leave open which determinate they instantiate. But this is to leave out what the world is ultimately like. A characterization of the world in determinable terms is *necessarily incomplete*. This failure may be evinced in terms of identity. A world in which my shirt is crimson is not identical with a world in which my shirt is scarlet. However, determinable properties alone cannot adequately capture this distinction. Both worlds instantiate the determinable property of red; as far as the determinable properties are concerned, the worlds are identical. We are, of course, looking for the individuating criteria in the wrong place. The world's character is given by its super-determinate properties. Correspondingly, the worlds can only be told apart at the super-determinate level.

I said it was implausible that my shirt possesses redness *fundamentally*. That is, I deny *determinable fundamentality*, the core of Wilson's objections. In conclusion, I offer this reductio. Suppose the opposite was true: that is, suppose my shirt was red, and it possessed redness fundamentally. Then suppose we have two worlds (φ and Ψ) with an identical distribution of fundamental properties, among them the fact that my shirt is red, and its redness is fundamental. Is it possible that in φ my shirt is scarlet, and in Ψ my shirt is crimson? We are inclined to answer affirmatively, since my shirt's being scarlet is perfectly consistent with the fundamental properties in φ , and likewise for the crimson shirt in Ψ . This is to say that *it is possible that world φ has a property which world Ψ lacks*. But this is to violate the maxim that fixing the fundamental fixes the content and character of the world! If two worlds are alike in their distribution of fundamental properties, then they are alike in all other respects (no change without a fundamental change).

The *reductio*, stated generally, works as follows. The assumption of determinable fundamentality (that some determinable properties are fundamental) is inconsistent with the following two structural claims:

1. Any worlds identical in their distribution of fundamental properties will be identical in all other respects (there is no difference without a fundamental difference). It is not possible that worlds have an identical distribution of fundamental properties but have a non-identical distribution of some other properties.
2. Every determinable property is capable of precisification: for every determinable property there is a set of determinate properties all of which possess the determinable property but which are non-identical with each other. (E.g., scarlet and crimson are both red, but are non-identical with each other.) It is possible that worlds have an identical distribution of determinable properties but have a non-identical distribution of some other properties.

I take 1 to be a truth about grounding, and 2 to be a truth about Determination. I therefore take the assumption of determinable fundamentality to be mistaken.

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