Grounding and Properties

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Abstract: Metaphysical grounding is often presented as a relation of directed dependence analogous to causation. The relationship between causation, properties, and laws of nature is hotly debated. I ask: what is the relationship between *grounding*, properties, and laws of *metaphysics*? I begin by considering the grounding analogue of Humean quidditism. Finding it implausible, I turn to the primitive-laws account of grounding, recently defended by Jonathan Schaffer and others. I argue this view is also unsatisfactory. I then present several possible dispositionalist-like accounts, and characterize the notion of a *power to ground*. I argue for three important conclusions: (i) each property essentially confers grounding powers; (ii) non-fundamental properties can be defined structurally in a particular sense, elucidating the claim that they are "nothing over and above" the fundamental; and (iii) fundamental properties play a central role in grounding the grounding facts. Finally, it is significant that, combined with a causal powers-account of causal explanation, the door is open to a unified account of the metaphysics of causation and grounding: both flow from the natures of fundamental properties.

Keywords: Grounding, properties, powers, structuralism

"Particular grounding facts must always be subsumable under general laws, or so it seems. It would be interesting to know why this is so." - Gideon Rosen[1]

What explains the existence of a set, say, the singleton set containing Socrates? If pressed, many metaphysicians would say the singleton set containing Socrates exists in virtue of Socrates's existence. Some of these metaphysicians might say: the fact that Socrates exists *metaphysically grounds* the fact that {Socrates} exists. Socrates is not, of course, special in this respect; for any A, it seems that

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[1]Rosen (2010), p. 132

the singleton set containing A exists in virtue of A's existence. Now one might wonder, what explains this pattern?

That there are patterns of grounding has not been lost on the contemporary literature. A prominent explanation of these patterns appeals to primitive "laws of metaphysics." In this essay I will explore another: the patterns of grounding reflect deep truths about the natures of properties.

To set the stage, I consider and reject an analogue of Humeanism (§2) that denies that there is an explanation of the pattern of metaphysical explanation. I then critically assess the primitive-laws account of grounding (§3). The arguments in these sections are not meant to be decisive, but motivate looking elsewhere for an account of the metaphysics of grounding. In §4, I characterize the notion of a *power to ground*. I argue that properties can be individuated by their powers to ground in §5, at least in a modest sense. I consider more robust structuralist accounts in §6. I find that a pure dispositionalism about grounding powers is not tenable, for familiar reasons. However, I argue that a hybrid "powerful qualities" view can avoid common objections. I then argue that my proposal supports an account of what grounds the grounding facts (§7). Finally, I **assess the compatibility of the** grounding powers account with the causal account of properties in §8.

There are several important conclusions. First, properties can be individuated by grounding powers. While some have made similar claims, I provide new arguments for this conclusion.[2] Second, non-fundamental properties can be defined structurally in a particular sense, elucidating the claim that they are "nothing over and above" the fundamental. Third, fundamental properties play a central role in grounding the grounding facts, at least for a wide range of cases (**perhaps excluding logical grounding**). Finally, it is significant that, if combined with a causal powers-account of causal explanation, we have a unified characterization of the metaphysics of causation and grounding: both flow from the natures of fundamental properties.

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[2]See Audi (2012, 2016), Bader (2013), and especially Rosen (2015).

1   Background

By 'grounding' I mean a non-causal determination relation between facts.[3] By 'grounds' I mean *fully grounds* unless otherwise noted. I take facts to be structured complexes built out of individuals and properties, but nothing that follows hangs on a particular account of facts (the main arguments also hold, mutatis mutandis, for grounding as a sentential connective). I assume that if A grounds B, then A also at least partly metaphysically explains B. (Perhaps laws of metaphysics are also part of the explanation but not part of the grounds; see §3 and §7 below.) For now, I'll take no stand on whether grounding can be decomposed into "small-g" grounding relations like composition, realization, and set formation.[4] (I will explicitly take these relations into account in §5.) I will assume that grounding is transitive and irreflexive, but we could get by with exceptions to either.

Next, a clarification of what it is for a property to play *a role in grounding*. (Later, I will use this notion to more carefully define individuation conditions for properties.) Consider the properties of *being scarlet* and *being red*: for any x, if x is scarlet, then x is red, and x is red *in virtue of* being scarlet. I will express this law-like grounding connection using a grounding operator '$\Rightarrow$' that allows binding variables for terms:[5]

x is scarlet $\Rightarrow_x$ x is red.

This operator is useful because it displays the law-like connection between scarlet and red, a connection that is presumably insensitive to the actual existence of red and scarlet things **(though not to existences of redness and scarlet-**

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[3]For this characterization see, e.g., Audi (2012), Trogdon (2013), and Skiles (2015). I thus assume *separatism*, the view that grounding is not identical to metaphysical explanation (Raven (2015)). In opposition is *unionism*, the view that grounding just is metaphysical explanation. Unionists typically still believe that some determination relation (or relations) "backs" grounding; they may substitute this relation (or these relations) in where I say 'grounding'.

[4]The term 'small-g' grounding relations is due to Wilson (2014).

[5]Cf. Glazier (2016), who uses an operator like this to define metaphysical laws, and the discussion of generic grounding in Fine (2016). Note that the operator is variably polyadic in the sense that it does not take a fixed number of arguments. See also Wilsch (2015a,b), who offers another approach to defining law-like grounding connections. The approach I present will be more convenient for capturing grounding connections between properties.

ness, as even a generic connection needs to connect something). The operator is also neutral on whether universally-quantified facts have a ground and whether they can be false or non-trivially true in the absence of instances.

Generalizing from the previous example, we have:[6]

$$\phi_1, \ldots, \phi_n \Rightarrow_{v_1, \ldots, v_m} \psi$$

In English, this says that there is a grounding connection between the properties involved in $\phi_1, \ldots, \phi_n$ and those involved in ψ, where $v_1, \ldots, v_m$ are variables bound by the operator. For convenience, I will abbreviate these statements into generic grounding connections between properties: 'Scarlet $\Rightarrow$ Red'. (Note that this abbreviation is generic in that it lacks specific reference to individuals; it being called 'generic' should not be taken to imply that it has exceptions.)

The next step in defining a role in grounding is take the conjunction of all true statements of generic grounding. We then have a kind of "metaphysical lawbook":

$$\ldots \& \; (\text{Scarlet} \Rightarrow \text{Red}) \; \& \; (\text{Red} \Rightarrow \text{Colored}) \; \& \; \ldots$$

Note that this lawbook governs grounding relationships between properties, but may not be an exhaustive "grounding lawbook", since there may be grounding relationships that do not bear any interesting connection to properties. For example, one might hold that existence is not a property but **the fact that the Mona Lisa exists grounds the fact that something exists.**

I will say that a property P is fundamental if and only if terms referring to P never occur on the right side of a generic connection without occurring on the left as well. (This allows that fundamental properties may be generically related to more logically more complicated constructions, e.g., P $\Rightarrow$ P $\vee$ Q.) Intuitively, the idea is that instances of fundamental properties are never grounded by instances of other properties.[7]

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[6]I follow the convention of omitting corner quotes, with the understanding that the use/mention distinction is clear from context.

[7]A complication arises if there are properties that are in some instances ungrounded and

We are now in a position to define what it means for a property to play a role in grounding. We can define the role of a property by **replacing** instances of terms referring to the property **with** a variable in our metaphysical lawbook. For example, the role played by red is (in part):

$$\ldots \& \ (\text{Scarlet} \Rightarrow P) \ \& \ (P \Rightarrow \text{Colored}) \ \& \ \ldots$$

We will now use this notion of a role in grounding to define a kind of "grounding quidditism" **and later** to individuate propertie**s, thereby introducing** a kind of grounding structuralism about properties.

2   Humean Quidditism about Grounding

Quidditists believe that properties are *quiddities*, that is, **they believe** properties do not essentially bear any necessary connection to each other; whatever connections **properties** bear are coincidental or imposed by laws. The two flavors of quidditism are *Humean quidditism* and *nomist quidditism*. Roughly, Humean quidditism is the view that all causal relations supervene on the distribution of quiddities, while nomist quidditism posits primitive laws that govern quiddities.[8] This section considers the extension of Humean quidditism to grounding, and the next nomist quidditism about grounding.

To define ground Humean quidditism, I will use the notion of grounding role defined above:

Ground Humean quidditism: For any property P that plays grounding role R_1 and property Q that plays grounding role R_2, it is metaphysically possible for P to have played R_2, and Q to have played R_1.

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others grounded. To account for these, we could introduce the idea of a 'fundamental instance' of a property **or assume that non-fundamental properties are always non-fundamental. I return to this point below in §5.**

[8]See the introduction of Lewis (1986) for a canonical statement of Humean quidditism, and Armstrong (1983) for a nomist-quidditist account.

For example, the ground Humean quidditist would believe that the properties red and blue could swap roles in grounding. If so, then something being royal would ground it being red, and something being scarlet would ground it being blue. Many will balk at this possibility—I think rightly so.[9]

To put the point another way, the ground Humean quidditist denies that grounding connections between distinct properties ever hold necessarily. While it is controversial whether grounding always holds with necessity (see, e.g., Skiles (2015)), few proponents of grounding (if any) think that grounding *never* holds with necessity. This is because grounding is typically introduced as a tight metaphysical connection. The ground Humean quidditist faces serious dialectical pressure to explain how such a tight connection could be thoroughly contingent.

Setting ground Humean quidditism aside, I will assume for the sake of argument that grounding relationships are metaphysically necessary.[10] But what explains this? Today many think that modal connections should have some explanation; we haven't yet satisfied our explanatory burden by noticing that properties are stuck in their grounding roles.[11] To explain the necessity and law-like patterns of grounding, some have turned to a nomist-quidditism about grounding, positing primitive laws of metaphysics governing grounding.

3   Laws of Metaphysics

Several authors have recently defended accounts of grounding that appeal to *laws of metaphysics*.[12] Metaphysical laws are meant to explain patterns of metaphysical explanation, just as dynamical laws explain patterns of physical

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[9]Are there any Humean quidditists about grounding? Kovacs (2019b) offers a unificationist account of metaphysical explanation that may count as a defense of Humean ground quidditism. A full examination of this view is beyond the scope of this paper.

[10]One might worry that I have unfairly ruled out dualism from the get-go by banning quiddity swapping with respect to ground. But note that the ban on quiddity swapping doesn't itself rule out dualism; the dualist can be construed as assigning a different grounding role to physical properties than the physicalist.

[11]See Sider (2019b) for recent discussion.

[12]See, for example, Rosen (2006, 2017a); Kment (2014); Wilsch (2015a,b); Glazier (2016); Schaffer (2018); Wasserman (2017); see also Dasgupta (2014); Sider (2011). See Wilsch (2020) for a recent overview of this topic.

events. I will call the view that there are primitive laws of metaphysics *nomism*. If true, nomism offers an explanation for the failure of Humean quidditism, without giving up the quidditist idea that properties lack any essential connections. In this section I briefly argue against nomism, thereby clearing the stage for ground anti-quidditism.

To be concrete, I will focus on Jonathan Schaffer's account, as (i) it only depends on general features of metaphysical explanation; (ii) Schaffer is explicit that his account is analogous to a Carroll-Maudlin account of natural laws, according to which natural laws are primitive posits;[13] and (iii) Schaffer explicitly rejects essence, thereby endorsing a form of nomist-quidditism.[14]

Schaffer (2018) argues that there are metaphysical explanations, and, if there are, there must be laws of metaphysics.[15] But if metaphysical explanations must appeal to laws, then it seems that some laws must be fundamental, at risk of circularity or an infinite chain.[16] Schaffer then argues that metaphysical laws are primitive posits, in analogy to the Carroll/Maudlin account of natural laws. Though primitive, the laws are aptly represented as having the structure of a function, from grounds to grounded.

I do not deny that there are laws of metaphysics, nor that laws play an ineliminable role in our understanding of the world (even a Humean may admit an ineliminable epistemic or practical role for laws). I do, however, deny that the laws are metaphysically primitive. By adding external constraints—laws of metaphysics—on properties, we do no justice to physicalist or ethical naturalist inclinations, which are about the natures of properties. **If grounding cannot secure a tight enough connection for the formulation of theses**

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[13]See Carroll (1994) and Maudlin (2007).

[14]My usage of 'nomism' matches the 'brute connectivism' of Dasgupta (2014). I prefer 'nomism' because of the close analogy between this family of views and the primitive laws account of causation.

[15]**See also Schaffer (2016, 2017) for Schaffer's views on laws (or "connecting principles") and grounding.**

[16]Here is a sketch of the argument. Suppose A metaphysically explains B via a law L. If L is not fundamental, then something must explain its existence via some law. That law cannot be L itself, on pain of circularity. So, L's existence must be explained by some law L$'$. But we can repeat this process for L$'$, and a kind of regress ensues. Conclusion: take some law as fundamental.

like physicalism and naturalism, then it is unclear what theoretical advance has been made by introducing the notion.[17]

To put the point differently, the reason to be dissatisfied with nomism is that nomism fails to discharge an explanatory burden for those who endorse theses like physicalism or naturalism. Jaegwon Kim puts it well in his criticism of primitive Nagelian bridge laws between, e.g., the mental and physical:

> C-fiber stimulation correlates with pain (in all pain-capable organisms, or in humans and higher mammals this makes no difference). But why? Can we understand why we experience pain when our C-fibers are firing, and not when our A-fibers are firing? Can we explain why pains, not itches or tickles, correlate with C-fiber firings? Exactly what is it about C-fibers and their excitation that explains the occurrence of a painful , hurting sensation? Why is any sensory quality experienced at all when C-fibers fire? When the emergentists claimed that consciousness was an emergent property that could not be explained in terms of its physical/biological "basal conditions," it was these explanatory questions that they despaired of ever answering. For them reduction was primarily, or at least importantly, an explanatory procedure: reduction must make intelligible how certain phenomena arise out of more basic phenomena, and if that is our goal, as I believe it should be, a Nagelian derivational reduction of psychology, with bridge laws taken as unexplained auxiliary premises, will not advance our understanding of mentality by an inch. *For it is the explanation of these bridge laws, an explanation of why there are just these mind-body correlations, that is at the heart of the demand for an explanation of mentality.*[18]

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[17]**Am I unfairly assuming physicalism and naturalism here? No. I am only arguing that nomism, understood as an analysis of grounding, does not provide a tight enough connection to secure theses like physicalism. Even if physicalism is false and nomism is true *of the mental*, in some domains a tighter connection is required. If grounding cannot bridge the gap in any domain, then there is little reason to introduce it. Thank you to an anonymous referee for raising this point.**

[18]Kim (1998), pp. 95–96 (emphasis in original). Cf. Kovacs (2019b).

It may be that a full-blooded reductionism is impossible. But the point Kim makes in the passage remains: insofar as we can offer an explanation of the correlations between ground and grounded, we are in a better explanatory position than those who take the connection as primitive. On **grounding-powers account** I offer below, the natures of properties explain grounding connections, and so the laws are not primitive posits. They are summaries of the natures of properties. **There are, consequently, theoretical advantages to the grounding-powers account over the nomist, laws-based account: on the grounding-powers account, the purely physical fully grounds the non-physical. Further, on the grounding-powers account we can make some sense of the idea that the non-fundamental is "nothing over and above" the fundamental (§6.2).**

The nomist may push back by pointing out that, just as primitive laws of physics are posited to explain events over time, the primitive laws of metaphysics explain higher-level facts. And isn't that just what we wanted—an explanation of the higher-level facts? In response, I grant that the nomist has achieved some level of explanation, but I can't see why it should satisfy the physicalist or ethical naturalist. True, on a Carroll-Maudlin account of physical laws, an event A can fully causally explain a later event B in conjunction with the law that events of type A bring about events of type B. But B remains wholly separate from A; I can't see a sense in which B might be thought to be "nothing over and above" A-plus-the-law. Likewise in the metaphysical case: even granting that the fact [S is in physical state P] and a metaphysical law L together determine the fact [S is in mental state M], and so P-plus-the-law *explain* why S is in M, we do not yet have reason to believe P and M are adequately connected in the right way to secure physicalism. For all that has been said, P and M are wholly separate properties that happen to bear a law-like connection.

An analogy draws out the point. It's long been thought that primitive laws between levels **seem** to commit us to a kind of **emergentism.** For the nomist, the fundamental non-nomic facts are not enough to explain the non-

fundamental; we also need a fundamental "staple" between the mental and physical, moral and natural, and more and less complex composites. This is not to deny that the physical is enough to *ground* the mental on Schaffer's account (Schaffer distinguishes the full grounds from the full metaphysical explanation). The point is that mental properties (for example) remain independent of the physical in that a complete explanation of the mental must involve both the physical grounds and a law connecting the physical to the mental. Because of this, nomism seems much closer to the emergentism of C. D. Broad than to physicalism.[19] What's missing? If the laws themselves could somehow be grounded in the purely physical facts, then the worry would dissolve.

In response, the nomist might argue that laws of metaphysics are not even apt for being grounded, and so nomism does not run afoul of physicalism. For example, Schaffer distinguishes the grounds, the grounded, and the laws. While facts can be both grounded and ground other facts, laws do not enter into the grounding structure, and so are not apt for being grounded. One challenge, however, is to explain complex grounded facts that involve laws. For example, consider the fact [**Some** law of metaphysics exists]. As an existentially quantified fact, it seems that it must be grounded by the existence of individual laws themselves. But then the laws *do* figure in the grounding structure.[20] This challenge aside, it remains the case that the laws are still *not grounded*, and so primitive in that sense. A complete description of the world would still need to list all the laws, including those connecting, for example, scarlet to red. Following Kim, we should not feel that our explanatory burden has been satisfied. We should seek a ground for the laws that is not itself a fundamental connection.[21]

The aim of this section has not been to decisively argue against the primitive-

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[19] **Here I refer to the "trans-ordinal laws" of Broad (1925).**

[20] **Gideon Rosen's examples of impure laws connecting the normative to non-normative may also present a challenge for those who think laws are not apt for being grounded. Impure laws are partly grounded in contingent matters of fact and partly in other laws, which may also be impure. See Rosen (2017b). Thank you to an anonymous referee for pointing out this connection.**

[21] **Dasgupta (2014) also** argues that there are brute connections between ground grounded that are not apt for being grounded. See Sider (2019a) and Kovacs (2019a) for critical discussion.

laws account of grounding and properties. Instead, I hope to have shown why we might prefer another theory. In the next few sections I describe and defend the grounding-powers account of properties. As will become clear, there are several independent reasons for adopting the grounding powers view.

4   Grounding Powers

Properties cannot freely swap roles in grounding (§2), but not because there are primitive laws constraining them (§3). In this section I will begin to explore an anti-quidditist approach that explains these results. **In the following sections I will tentatively suggest that fundamental properties play their roles in grounding essentially but also have primitive identities, while non-fundamental properties are fully metaphysically defined by their roles in grounding, meaning a kind of dispositionalism holds of the non-fundamental properties with respect to grounding.**

Much ink has been spilled attempting to define the notions of power and disposition. I will only aim for characterization. To characterize the notion of a grounding power, I will draw on Alexander Bird's recent characterization of the literature on causal powers. Bird argues that most powers theorists endorse one or both of the following claims:[22]

(a) A power is an ontic property[23] that has a dispositional essence.

(b) A power is an ontic property whose identity is given by its causal/dispositional/nomic role.

These conditions are clearly related. Importantly, they entail that a power is property that is *modally fixed* with respect to causation.

To establish a parallel thesis about grounding and properties, I will argue (i) properties have dispositional essences with respect to grounding (though this

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[22]Bird (2016), pg. 345. See Bird for additional citations from the powers literature.

[23]Bird uses 'ontic property' to indicate a metaphysically-loaded understanding of properties, rather than a cheap understanding as whatever may be represented by a predicate.

might not exhaust their essence), and, in the next sections, (ii) the identities of properties are fixed by their roles in grounding.

First, properties have dispositional essences with respect to grounding. Like causation, grounding (or small-g grounding relations) **is** *generative.*[24] If my brain state grounds my mental state, then my brain state *brings about* or *makes it the case that* I am in that mental state. Further, this generative aspect of grounding licenses dispositional explanations. For example, suppose person A goes into a permanent vegetative state, while person B goes into a deep, dreamless sleep. Both, we can assume, lack any phenomenal states. What's the difference between the two? Person B, while sleeping, still has properties that confer the power to ground mental states if awoken, while person A lacks these properties. **Importantly, this is not a causal power, since the physical state of the sleeping person has the potential to asynchronously ground mental states. On this basis we distinguish the two: one is permanently in a coma, the other has the potential to wake. So, not all disposition ascriptions are underwritten by causal connections.**

This prima facie plausible connection between causal and grounding powers is strengthened by the claim that grounding connections between properties are explained by the natures of the properties involved. I will put this claim in terms of essence, loosely following Kit Fine.[25] Let **R be the** grounding role of a property P (R in effect **includes** all the laws of metaphysics that P plays a role in). Then, the property P is essentially such that it plays role R. **Following Fine, I will represent this fact as:** $\Box_P$ R(P). Further, as I argue in the next section, properties are individuated by their grounding powers. We thus have a non-reductive but illuminating analysis of properties and grounding. The natures of properties explain what grounds what, and grounding defines the natures of properties.[26]

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[24]See Bennett (2017) for discussion of the generative aspect of relations like grounding (what she calls "building relations").

[25]See, e.g., Fine (1995).

[26]This is analogous to the causal view of Shoemaker (1980), who offers his account of causation and properties as circular but illuminating.

5   Grounding Powers: Individuation

In this section I argue that properties are individuated by their grounding powers, and then in the following sections I consider "structuralist" spins on this result.[27] The strategy is to use the notion of a role in grounding defined in §2 and argue that each role can only be played by a single property. However, I will also argue that it is not possible to go fully-structuralist. The reason is that, while all properties are individuated by their roles in grounding, fundamental properties cannot be fully individuated using only the structure imposed by grounding. This rules out a completely structuralist account of properties in terms of grounding, but allows a structuralist account of non-fundamental properties in terms of the fundamental.

Recall that a role in grounding is defined in terms of a formula of generic grounding, as in the following example of the role played be red:

$$\ldots \& \ (\text{scarlet} \Rightarrow P) \ \& \ (P \Rightarrow \text{colored}) \ \& \ \ldots$$

As discussed above in §2, each property is "stuck" in its grounding role: properties can't swap roles. It is also prima facie plausible that every property has its own role in grounding. Consider two grounded properties P and Q. If P and Q play the same role in grounding, then they bear all the same generic grounding connections to other properties. **Further, I assume that if a property has a ground then, necessarily, every instance of the property must have a ground. In other words, non-fundamental properties are essentially non-fundamental.**[28] It follows that P and Q are necessarily co-extensive, as

the ground for one will always be the ground for the other. To nevertheless maintain that P≠Q requires a level of hyperintensionality few would accept: necessarily co-extensive properties that **make no difference to what other properties are instantiated**.

I accept that there are distinct but necessarily co-extensive properties, but only in motivated cases. Consider, for example, the properties of being triangular and being trilateral. Arguably, these are distinct, as one is the property of being a polygon with three *angles*, and the other is the property of being a polygon with three *sides*. This result is predicted by the thesis that properties can be individuated by their roles in grounding. A polygon is triangular in virtue of having each of the three angles it in fact has, and a polygon is trilateral in virtue of having the three sides it in fact has. The grounding role for triangularity will include formulas like the following:

$$\ldots \& \ (\text{has angles } a_1, a_2, a_3 \Rightarrow P) \ \& \ (P, \text{red} \Rightarrow \text{red triangle}) \ \& \ \ldots$$

This formula cannot be satisfied by the property of being trilateral, since being a trilateral is not grounded in having angles. It seems that nothing else can satisfy the formula except triangularity. But, if nothing else can, then the open formula individuates the property.[29]

Note that nothing said so far explicitly prevents two *fundamental* properties from playing the same grounding role without being necessarily co-extensive. In each instance the properties would ground all the same non-fundamental properties, but there is nothing in the theory requiring co-instantiation of the fundamental properties. That said, there is still strong prima facie reason for thinking that no two fundamental properties play the same role in grounding. **Given that grounding is the relation that backs metaphysical explanation (or is even identical to it), then if two properties play the same**

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[29]While I take on board hyperintensionalism, the view could be adapted by an intensionalist who uses the tools of essence and grounding in a more coarse-grained way. See Rosen (2015) for related discussion.

role in grounding, they also make the same contribution to metaphysical explanations. How could there be different fundamental properties that make no metaphysical difference? Any theory that posits such properties would immediately fall prey to Occam's razor. Without strong positive reason for positing such properties, we should provisionally accept that each fundamental property plays a unique role in grounding.

These considerations may not be entirely convincing. One might worry that I am ignoring the possibility of symmetric grounding roles of **possible** fundamental properties, like of matter and anti-matter. **Suppose that matter and anti-matter are both fundamental properties and that** there is no way to distinguish them by appeal to the grounding structure; **they build up physical reality isomorphically.** Can I really rule out all examples like this a priori? Two responses. First, matter and anti-matter play different causal roles, so this example may support including causation as a primitive individuating relation alongside grounding, a possibility I consider below. Second, **I can concede that fundamental properties are not individuated by grounding while maintaining the substantive thesis that** (i) fundamental properties essentially play their roles in grounding and (ii) *non-fundamental* properties are fully individuated by grounding plus the fundamental properties. I discuss this view below.[30]

One might also object that it could be that properties P and Q play a role in *constituting* an instance of some property R while also *realizing* some other property S. For example, the arrangement of gold molecules in Maurizio Cattelan's artwork "America" both constitute a sculpture and realize the functional kind *toilet*. If there are two distinct things, America-the-toilet and America-the-sculpture, and the existence of each has the same ground, then we risk collapsing important distinctions by only appealing to grounding.[31] Fair enough. To avoid

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[30]Thanks to an anonymous referee for pushing this response.

[31]One might object that the existence of the sculpture, but not the toilet, is partly grounded in the artist's intentions. In response, note that the artist's intentions plausibly play a different role in bringing about America than the gold molecules. This difference is unlikely to be captured purely in terms of grounding. If so, we may still need to recognize metaphysical relations other than grounding.

this risk, we will take into account which small-g grounding relation is at work in the next section.

One might also wonder about properties that seem essentially causal. For example, consider Robert Boyle's example of a lock and key (Boyle (1999)). To be a key is to have a certain causal power: to open a lock. Without the lock, a molecule-for-molecule duplicate of the key would not really be a *key*. But, if so, the property of being a key is partly individuated by its causal role. This argument is interesting but not decisive, since example is at the non-fundamental level. To be decisive, the example would need to be two fundamental properties individuated causally but not by grounding. That said, in §8 I argue that the grounding-powers account is compatible with the causal-powers ontology. If we add causation to the many grounding-like relations, then the set of individuating relations is the set of what Karen Bennett calls *building relations*.[32]

The proposed account is modestly structuralist in that it places some structural constraints on the metaphysical lawbook. Suppose we had the following grounding lawbook: $P \Rightarrow Q$, $Q \Rightarrow R$, $P \Rightarrow T$, $T \Rightarrow R$, and nothing else. The foregoing account rules out this lawbook, since the roles played by Q and T cannot be distinguished. An acceptable lawbook with the requisite asymmetry: $P \Rightarrow Q$, $Q \Rightarrow R$, $W \Rightarrow T$, $T \Rightarrow R$. The account is only *modestly* structuralist in that we still refer directly to particular properties in defining the structure, like P, Q, and R.[33] One reason to be less modest is that we cannot do justice to the thought that the grounded is "nothing over and above" its ground if the identities of non-fundamental properties are ineliminable from our account. Below, I will argue that we can be less modest about non-fundamental properties.

6 Structuralism

I have defended a modest structuralism about properties: properties can be individuated by their roles in grounding. One might now wonder: can we be

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[32](Bennett (2011b, 2017).

[33]See Hawthorne (2001), who discusses a modest causal structuralism.

less modest? One reason to adopt a less modest structuralist account is that we should do more to secure a tight enough connection between the fundamental and non-fundamental to secure theses like physicalism. Physicalism is often thought to require that the non-physical be "nothing over and above" the non-physical. The "nothing" is typically not intended literally, since if A grounds B, B is something distinct from A.[34] But the goal remains to make the connection as tight at possible. A more thorough-going structuralism might offer a tighter connection.

6.1 Full Structuralism

A fully structuralist account banishes *all* mention of particular properties from a fundamental description of the world. The view can be defined by ramsifying the lawbook by quantifying out all the predicates for particular properties:[35]

$$\exists P \exists Q \exists R \exists S \exists T \dots (P \Rightarrow Q \ \& \ R \Rightarrow T \ \& \ P, Q \Rightarrow S \dots)$$

The full structuralist then claims that this is a complete fundamental description of reality; all facts about particular properties—such as my shirt being red—reduce to this fundamental description. This view is analogous to a "pure powers" or "dispositionalist" view of causation and properties.

This account may be appealing to those with structuralist inclinations, but it likely goes too far in the structuralist direction. **On most accounts of grounding, grounding is ubiquitous; any two property instances ground many other facts. This is especially true if we admit logical grounding, since any two property instances ground conjunctive and disjunctive facts. The structuralist requires that every property has some unique structural feature that allows it to be identified; we ought to be able to use the Ramsey sentences alone to identify each property. It is unclear whether there will be sufficient asymmetry in**

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[34]Cf. Audi (2012), p.709–710.

[35]This way of defining theoretical terms traces back to Ramsey (1978); see also Lewis (2009).

the grounding structure to individuate properties in this way.[36]

6.2 Intermediate Structuralism

An intermediate position between full and modest structuralism offers a stable middle ground. We should be modest structuralists about the fundamental and full structuralists about the non-fundamental. On this view, the fundamental lawbook does not mention non-fundamental properties, but it does name fundamental properties. By quantifying out the non-fundamental properties, we tighten the connection between the ground and grounded, thereby doing some justice to the idea that non-fundamental properties are "nothing over and above" their grounds. I will call the view that this lawbook fully describes the metaphysical laws *intermediate structuralism*.

To illustrate, consider a list of fundamental properties, with 'Fnd_n' referring to the nth fundamental property in the list. Then our metaphysical lawbook takes a form like the following:

$$\exists P \exists Q \exists R \ldots ((Fnd_1 \Rightarrow P) \mathbin{\&} (Fnd_2, Fnd_3 \Rightarrow Q) \mathbin{\&} (P, Q \Rightarrow R) \ldots)$$

Call the complete statement of the laws 'L'. L says that the fundamental properties (which are named) bear certain structural relations to non-fundamental properties. L doesn't name the non-fundamental properties but only uses a higher-order quantifier to describe the structure. We can recover a role a property plays by either (i) substituting a variable for a name of a fundamental property or (ii) removing a quantifier to make an open formula about a non-fundamental property.

Are properties individuated by this structure? Grounding is ubiquitous, so one might worry that there will be symmetries in the structure. For example, **as mentioned above,** it might be that **a fact** F grounds both F ∨ F and F & F.

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[36]Alexander Bird, aware of this problem in his discussion of a pure dispositionalism about causal powers, argues that it is possible to draw graphs that have the requisite asymmetry (Bird (2007)). Each node in the asymmetric graph can be uniquely described with respect to the other nodes. But, given the ubiquity of even the small-g grounding relations, it is unlikely that the asymmetric graphs represent the actual structure of the world.

Or some fundamental properties might constitute one fact and realize another. If so, then the essence of non-fundamental properties won't be well-defined by the structure: for some distinct P and Q, it will be the case that R(P)=R(Q).

To meet this worry, we should recognize the contribution of small-g grounding relations of constitution, realization, determinable-construction, and the like. This either requires recognizing a singular grounding relation holding in various flavors, or else recognizing relations coeval with grounding. Either way yields more structure:

$$\exists P \exists Q \exists R \exists S \ldots ((Fnd_1 \Rightarrow^c P) \ \& \ (Fnd_1, Fnd_2 \Rightarrow^r R) \ \& \ (P, Q \Rightarrow^d S) \ldots)$$

Call this revised sentence with superscripts marking small-g grounding relations 'L'.[37]

The same style of argument for the individuation of properties as in the case of modest structuralism applies to intermediate structuralism. Suppose for *reductio* that there are two properties P and Q at some non-fundamental level that play the same role. As before, it follows that P and Q are necessarily co-extensive, as any possible ground for P is also a ground for Q. Further, by assumption, no metaphysical tool like grounding, constitution, etc. distinguishes the properties, as in the case of triangular and trilateral. P and Q are two non-fundamental properties that are always grounded in the same way by the same things, but nevertheless distinct.

Given P and Q as described, we have $P \neq Q$, with no plausible reason for distinguishing P and Q. It seems that if P and Q are non-fundamental but non-identical then that should make some metaphysical difference, either in their essences, real definitions, or grounds. **But, it seems there could be**

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[37]**One might be skeptical that instances of *being red or blue* (a disjunctive property) and *being red and blue* (a conjunctive property) involve distinct small-g grounding relations. If they involve the same, *logical grounding*, then we have further reason to treat logical grounding independently. However, there may be reason to think conjunction-construction and disjunction-construction are distinct; see Wilsch (2015a,b) for a view that distinguishes small-g grounding relations at this level of grain. Thank you to an anonymous reviewer for raising this point.**

no such difference in this case, since each is grounded by the same fundamental properties combined in the same way. One *could* posit a primitive difference in essence between P and Q, but is is unclear why one would ever be motivated to; they arise in the same way in all the same circumstances from the same fundamental properties. Thus it seems we should reject the *reductio* hypothesis that P and Q play the same role.

Following this line of reasoning, I posit that the nature of each non-fundamental property is exhausted by its role in the grounding structure: for each non-fundamental property P, we have $\Box_P R(P)$, where R(P) is specified by L′, and R(P) exhausts the nature of P. In this sense the essence of each property is structural, and a "pure dispositionalism" holds of the non-fundamental properties with respect to grounding. Compare the following view of spacetime points: there are spacetime points, but their essences are exhausted by place their place in a physical, e.g., metric, structure.[38] On the proposed account, non-fundamental properties are like spacetime points so understood. They exist, but their essences are exhausted by their role in the grounding structure. **This is the sense in which non-fundamental properties are "nothing over and above" the fundamental. Non-fundamental properties are a merely a structural addition to reality; each is the result of an iterative constructive process of fundamental (and then non-fundamental) properties combining to form new properties.**

As argued in the previous section, the fundamental properties cannot be fully defined structurally. Are the fundamental properties purely categorical? This is murky territory, but I believe they are not. **In particular, on the grounding-powers account I propose, the fundamental properties taken together determine all grounding relationships.[39] Put in terms of essence, we might say: $\Box_{Fnd_1, Fnd_2, ...} L'$ (it is in collective nature of the funda-**

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[38] See Teitel (2019) for a recent discussion of structuralism about spacetime. The analogy with spacetime is suggested by Cross (2013) with respect to causal dispositionalism and McDaniel (2015) with respect to the identities of propositions.

[39] With the possible exception of logical grounding, as mentioned above.

mental properties that L′ holds). The fundamental properties necessarily confer grounding powers and so are essentially grounding-dispositional in that respect. Perhaps they are best considered like Heil and Martin's "powerful qualities" (a mix of categorical and dispositional).[40] The fundamental properties are also (somewhat) like Leibnizian primitive forces: intrinsic properties that bring about the non-fundamental, including structural physical properties.[41] As such, on the intermediate structuralist position, fundamental properties are best described as *ground Leibnizian quiddities*: quiddities that primitively confer grounding powers.[42]

One might object that the foregoing account violates a relevance constraint on essence. For example, suppose that for any P, Q, and A, we have [Pa] grounds [Pa ∨ Qa]. Then it would seem that on the proposed account each property's nature must contain every other. Two responses. First, it is plausible that something more generic is part of every property's nature. Namely, each property is such that it can play a role in grounding disjunctions.[43] Second, if the previous response fails, we could limit our discussion to non-logical grounding. We would then be dealing with a sparser collection of properties that does not include every logical construction from the base.

One might also worry about the existence of a fundamental level. The intermediate structuralism depends on there being a fundamental level in the grounding order of properties (though it does not assume there is a fundamental level in the mereological sense). I will not argue for this assumption, but will only point to the theoretical benefits of the proposed theory: assuming physicalism, we have a characterization of how the mental is "nothing over and above" the physical; we have an explanation of the modal connections between ground and grounded in terms of essence; and, for those who embrace the causal pow-

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[40]See, for example, Martin (1997) and Heil (2003).

[41]For discussion of Leibniz on primitive force, see Adams (1994) and Jorati (2019).

[42]Alter and Pereboom (2019) suggests the term "Leibnizian quiddity" for a quiddity that is the categorical basis of a causal power.

[43]**How would this be best spelled out in the grounding lawbook? One option is to allow binding of second-order variables by the generic grounding operator:** $P \Rightarrow_X X \ \lor \ P$.

ers account of causation, we have a unified theory of causal and metaphysical explanation.

I conclude that intermediate structuralism offers a plausible middle ground between modest structuralism and full structuralism. To summarize the proposal so far:

- All properties are individuated by their role in grounding in the sense implied by modest structuralism (i.e., by small-g grounding relations and the fundamental properties).[44]

- $\Box_{Fnd_1, Fnd_2,...}L'$ (The entire structure follows from the natures of fundamental properties).

- For each non-fundamental property P, $\Box_P R(P)$ (it follows from the nature of P that it plays its role in L'), and nothing else is part of the essence of P.

7 Grounding Grounding

Suppose A grounds B. What, if anything, grounds that fact?[45] By Sider's purity principle, it seems that it should have a ground, since it involves B, which is non-fundamental.[46] Further, suppose physicalism is the theory that the world is fundamentally physical. Then if the facts about grounding are themselves ungrounded, physicalism is false, since the fact that a physical fact grounds a mental fact itself involves the mental. So, grounding facts need a ground if we are to adequately formulate theories like physicalism in terms of grounding.[47] In this section, I apply intermediate structuralism to the question of what grounds grounding. In lieu of a full comparison with rivals, I highlight some of the positives of the present account: (i) it bolsters a plausible account of what

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[44] As mentioned above, this thesis is negotiable without serious loss to the overall account.

[45] When we ask what grounds grounding, it must be that the first instance of 'ground' refers to fact-fact grounding, since we are in effect asking: what generates the small-g grounding facts? The second instance ranges over the various small-g grounding relations.

[46] The "purity principle" is that fundamental truths involve only fundamental notions. See Sider (2011), pp. 106–107.

[47] Dasgupta (2014).

grounds the grounding facts, namely *upwards anti-primitivism*; and, in doing so, (ii) it allows that everything grounds out in the purely fundamental.

To begin, let's return to an earlier insight: if something's being scarlet grounds it being red, then this is in virtue of what it is to be scarlet. This insight motivates the view that the grounds also play some role in explaining the grounding fact. Bennett (2017) calls this kind of view "upwards anti-primitivism" about grounding. On her account, the fact [A is scarlet grounds A is red] is grounded by [A is scarlet]. Generalizing, if [A grounds B], then A grounds [A grounds B].[48]

Shamik Dasgupta challenges upwards anti-primitivism, arguing that it is insufficiently explanatory.[49] First, a single fact A can ground various facts B, C, etc. But then each of these grounding facts gets the same explanation, namely, A. Second, an explanation of why A grounds B ought to also capture the patterns of grounding of which [A grounds B] is an instance. For example, according to upwards anti-primitivism, [My jacket is red grounds my jacket is colored] is grounded by my jacket being red. But, the challenge goes, this does not do justice to the pattern of red things being colored. An explanation of the grounding connection from my jacket being red to my jacket being colored ought to unify the red things under the pattern of red things being colored. To capture these features, Dasgupta argues we should include an essential connection in the grounds of the grounding fact.[50] For example, [My jacket is red grounds my jacket is colored] is grounded by (i) My jacket is red and (ii) it is in the nature of being colored that red things are colored.

Dasgupta's account is plausible and close to the account I propose. The primary differences are that I do not include the essence fact in the grounds of ordinary grounding facts, and I do not think facts about the essences of non-fundamental things are ungrounded. Having assumed separatism (the thesis

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[48]See also Bennett (2011a) and deRosset (2013) for statements of this view.

[49]Dasgupta (2014, 2019).

[50]In Dasgupta (2019), Dasgupta yields to pressure to include the essential connection in the initial grounds as well: A plus essential connection E ground B. This is a form of upwards anti-primitivism, but falls prey to the arguments against nomism. See also Kovacs (2019a) for arguments against this view.

that grounding is not identical to, but "backs" metaphysical explanation), we have the option of allowing that essence facts are explanatory without being committed to them grounding the grounding facts.[51] We should distinguish what *produces* [A is scarlet grounds A is red] from what *explains* that fact, where the latter notion may involve **additional** conditions.[52] **In particular, by distinguishing grounding and metaphysical explanation we can recognize the epistemic role played by essence of the grounded property in the complete explanation. Arguably, [A is scarlet] produces (generates, determines, brings about) [A is red] all on its own, and so also fully produces the fact that it produces [A is red]. This is compatible with the additional claim that to fully understand this relationship we must understand something about the essence of red.**

Putting these ideas together, we can now say the following: (i) [A is scarlet] grounds [A is scarlet grounds A is red] and (ii) [A is scarlet grounds A is red] is explained by the [A is scarlet] plus $\Box_{Scarlet}$R(Scarlet). In other words, facts about grounding are explained by the ground and the natures of the properties involved therein. We thus have an explanation of patterns of grounding: patterns of grounding are due to the natures of properties.

Though I agree with Dasgupta that essential connections play an important role in metaphysical explanation, I take the essential connections themselves to be grounded. In particular, I propose that the natures of the fundamental properties (or, the fact that they have the natures they do) ground the fact that each non-fundamental property plays the role it does, e.g., $\Box_{Scarlet}$R(Scarlet). This follows naturally from the claim that the whole grounding structure, and so R(Scarlet), is essential to the fundamental properties: $\Box_{Fnd_1, Fnd_2, ...}$L'. There is no violation of Sider's purity principle, since the natures of the non-fundamental properties are structural, and so do not directly mention the non-fundamental.

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[51]Dasgupta himself does not endorse separatism, and so this may be a verbal dispute. See Bennett (2019) for discussion.

[52]See Kovacs (2019a) for a discussion of various ways of understanding the question of what grounds grounding and how to incorporate **additional** conditions like laws or essential connections.

Given that we have taken for granted the identities of fundamental properties, this is a natural position. After all, the fundamental properties generically ground the structure above them.

8 Causation

To close, I will argue that the grounding-powers account of properties can accommodate three analyses of causal connections: causal Humean quidditism, Armstrongian primitive necessitation between universals, and Shoemakerian dispositionalism. This demonstrates that the present account is independent of the debate over causal powers. That said, I believe those who recognize primitive causal powers have extra incentive to take on board grounding powers, yielding a unified *building powers* account of causal and metaphysical determination.

First, we might deny causation even the most derivative role in individuating properties by adopting causal Humean quidditism, à la Lewis (2009). On this account, it is typical to think of causal powers reducing to the truth of counterfactuals, which supervenes on the distribution of non-causal particular matters of fact (e.g., Lewis (1986)). Intrinsic properties may freely swap causal roles across worlds.

Causal Humean quidditism is compatible with the grounding-powers account of properties; one could be a causal Humean quidditist but a ground Leibnizian quidditist. Given the Humean's commitment to Humean supervenience, this is a natural position to take. A proponent of this package of views recognizes that something about the intrinsic nature of the fundamental properties explains how each property can play functional roles, for example. But they can also admit that a different arrangement of fundamental properties could bring about different causal facts, meaning that fundamental properties could swap causal roles in a suitably permuted mosaic. This is true even if causal facts are grounded in non-causal facts.[53]

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[53] Audi (2016) suggests that if power-conferral is a case of grounding then sameness of causal role is necessary for property identity across worlds. But, as the foregoing discussion shows, this is only true if having the property is sufficient to ground having the power, i.e., context

Moving now to anti-Humean accounts of causation, we can distinguish two anti-Humean accounts that are compatible with the grounding-powers account. First, the Armstrongian posits a primitive necessitation relation N between universals: FNG.[54] This necessitation relation only contingently holds between any particular universals, i.e., $\diamond\neg FNG$. The Armstrongian can be aptly represented as positing that one of the fundamental properties is this necessitation relation: for some n, $Fnd_n = N$. Causal facts are then grounded in facts about the distribution of fundamental universals and the necessitation relation. So, the Armstrongian about nomological necessitation can accept the grounding-powers account of properties.

Next, instead of primitive laws or necessitation, the dispositionalist argues that properties have causal essences. On one version of this view, properties are *fully* individuated by their roles in causation. This view is not compatible with grounding structuralism, since grounding structuralism posits that properties are individuated by their roles in grounding, not causation. But there is a possible consistent combination of causal and grounding structuralism. According to this view, it is essential to properties that they play their roles in the causal and metaphysical laws. It is in the nature of mass, for example, to play a certain role in the natural laws, and it is also in the nature of mass to play its role in grounding-like relations. The resulting view is that it is part of the essence of each property to play its role in grounding-like relations plus causation, i.e., building. We thus have a *building powers* account of properties. Differences in causal role across worlds would then be sufficient for difference in properties. But difference in causal role is not necessary for difference in properties. For example, the sets {1, 2} and {3, 4} arguably play the same causal role (namely, they cause nothing). Yet, they have different grounds for their existence, and so are individuated by their role in building. I hope to develop this view in future work.

To summarize the proposal:

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doesn't matter.

[54]Armstrong (1983).

- All properties are individuated by their role in grounding (i.e., by small-g grounding relations and the fundamental properties), with the possible addition of causation (building relations).

- $\Box_{fnd_1,\ldots}L'$ (The entire structure flows from the natures of fundamental properties).

- For each non-fundamental property P, R(P) (where 'R(P)' refers to the role P plays in L') exhausts the essence of P.

- Upwards anti-primitivism holds of grounding. When it comes to metaphysical explanation, essence facts play a role, but non-fundamental essence facts are themselves grounded in the natures of fundamental properties.[55]

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