Metaphysical

Interdependence

ABSTRACT: It is commonly assumed that grounding relations are asymmetric. Here I
develop and argue for a theory of metaphysical structure that takes grounding to be
nonsymmetric rather than asymmetric. Even without infinite descending chains of
dependence, it might be that every entity is grounded in some other entity. Having first
addressed an immediate objection to the position under discussion, I introduce two
examples of symmetric grounding. I give three arguments for the view that grounding is
nonsymmetric (I call this view 'metaphysical interdependence'). These arguments are: (i)
that metaphysical interdependence is the only theory able to reconcile competing
intuitions about grounding; (ii) that it is the only theory consistent with both 'gunk' and
'junk'; and (iii) that offers a satisfactory solution to the problem concerning whether or
not grounding is itself grounded.

KEYWORDS: grounding; explanation; metaphysical structure; symmetry;
interdependence; coherentism

1. Introduction

I assume the existence of a distinctive relation of non-causal dependence: the
grounding relation. Intuitive examples of grounding can help to elucidate the notion.
Consider, for example, the relationship that obtains between Socrates' singleton – the
set that only has Socrates as a member – and Socrates himself (see Fine 1995, 271),
where Socrates' singleton exists *because* Socrates exists. Grounding can be understood
as a relation of metaphysical explanation, as emphasised by the 'because' in the
previous sentence. Claims about the dependence of truths on their truthmakers are
also plausibly construed as grounding claims (e.g. Rodriguez-Pereyra, 2006: 960;
Correia, 2011) – we get a particular truth *in virtue of* the existence of the relevant

truthmaker. The truth is thus grounded in the truthmaker. Borrowing another kind of example of grounding from Schaffer (2009, 375), the Euthyphro dilemma concerns whether an act is morally right because it is approved by the gods, or is approved by the gods because it is morally right. If we take the first horn of the dilemma, then the rightness of the act is grounded in the approval of the gods. If the latter, the approval of the gods is grounded in the rightness of the act.

Grounding has been assumed to be a relation between various sorts of things, including actual concrete objects (as in Schaffer, 2010), facts (as in Fine, 2001), properties, states of affairs and tropes. I will stay neutral, so far as possible, about the relata of the grounding relation, and will assume that every entity in the domain(s) under discussion (be it facts, objects, states of affairs etc., or any combination) enters into grounding relations.[1] Note that my use of expressions such as 'x grounds y' is not intended to exclude the possibility that there are further entities that also ground y, and so the reader might instead read 'partially grounds' if that locution is preferred. In this paper I use 'x grounds y', and 'y (ontologically) depends on x' synonymously. My favoured neutrality extends to the expression of grounding claims. Some (e.g. Schaffer, 2009; 2010; Rosen, 2010) prefer a formulation that makes use of a relational predicate (e.g. x grounds y) whilst others (e.g. Fine, 2001; 2012; DeRosset, 2013) prefer to express grounding claims using a sentential connective such as 'because' or 'in virtue of'.[2]

Grounding is usually taken to be transitive, irreflexive and asymmetric (e.g. Cameron, 2008; Rosen, 2010; Schaffer, 2010; Clark and Liggins 2012, 817). In this paper I develop a theory of metaphysical structure generated by dropping the asymmetry constraint on grounding. I call this theory 'metaphysical interdependence' (or 'interdependence' for short). Interdependence is an alternative to both the traditional foundationalist view, and the infinitist conception of metaphysical structure already

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[1] This will allow me to be permissive with my formulation of grounding claims. Note that a more restricted conception of grounding might interfere with some of my examples, but should still be consistent with the nonsymmetric conception of ground I advocate here.

[2] Here I switch between these formulations, but those who take this to be problematic can reinterpret the relevant claims using their preferred formulation without significantly affecting the main argument here.

discussed in the literature (and described below). Whilst the possibility of symmetrical grounding has been raised by some (e.g. Fine 2012a; 2012b on 'weak ground'), with the exception of Bliss (2011) (who develops a detailed account of a cluster of positions she calls 'metaphysical coherentism') there is little defence of the possibility of symmetrical grounding, or serious discussion of resultant theories of metaphysical structure.

In §2 I briefly identify the main positions in the debate, and §3 deals with an immediate challenge to a nonsymmetric theory of ground based on the link between grounding and explanation. In §4 I give cases that I think are best described as instances of symmetric grounding, and in §5, §6 and §7 I offer three separate arguments for metaphysical interdependence. My aim in this paper is not to provide a thorough defence of metaphysical interdependence; rather it is to develop and explore the view, to highlight some of the motivations for doing so and to identify some of the forms a defence of the position might take.

2. Foundationalism, infinitism, interdependence

An entity x is ontologically fundamental when nothing grounds x (Schaffer 2009, 374). In the current literature, two theories of grounding dominate. These two theories can be distinguished by what they have to say about well-foundedness:

> **Well-foundedness**: for all x, x is either grounded by some fundamental entity or entities, or is itself a fundamental entity.

To facilitate discussion of my own position there is a second thesis by which we might further distinguish theories of metaphysical structure:

> **Asymmetry**: for all x and all y, if x grounds y, and $x \neq y$, then y does not also ground x.[3]

Following Fine (2012a: 50), we can distinguish between full and partial grounds. x is a full ground for y if x, on its own, provides the entire metaphysical explanation for y;

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[3] That x and y are not the same entity is built into my definition of asymmetry here so that my characterisation of the positions in the debate is acceptable both to those holding that grounding is irreflexive, and for those (e.g. Lowe, 2010 and Jenkins, 2011) who do not wish to rule out the possibility of reflexivity.

no entity other than x is required for y to be fully grounded. x is a partial ground for y if x, by itself or with some other entities, is a ground for y. In this paper, 'grounds' is to be read as 'partially grounds', and so asymmetry dictates that no entity y can be a ground for x (i.e. can be a member of the set of entities that jointly comprise a complete ground for x) if it is the case that x appears amongst the grounds for y. Asymmetry therefore guarantees grounding only goes one-way, and thus allows that entities can be related in linear chains of grounding. Once we admit of a grounding relation that applies to every entity in the relevant domain (as assumed here), the possible combinations of attitudes towards these two theses give rise to four main positions.[4]

Acceptance of both well-foundedness and asymmetry leads to what can be considered the orthodox position in the debate over metaphysical structure: metaphysical foundationalism. Foundationalists hold that grounding chains terminate in one or more fundamental entities, and as we move up the chain from the fundamental we encounter entities that can be considered increasingly derivative. Since grounding is transitive, the fundamental entities collectively provide the 'ultimate ground' for reality. The collection of fundamental entities can thus be thought of as comprising reality's 'fundamental level'.

The metaphysical foundationalist position is analogous to foundationalism in epistemology. Foundationalist theories of epistemic justification hold that all justified beliefs are either properly basic beliefs, or are justified inferentially through linear chains of belief that terminate in properly basic beliefs. Properly basic beliefs are those for which no further justification is required (canonical examples include *a priori* beliefs and appearance beliefs). The debate about the structure of justification can help shed light on the less-well-understood debate about metaphysical structure, and so the analogy is one I will return to.

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[4] For ease of discussion, we can assume at this point that proponents of each view of grounding take their position to hold with necessity. I later discuss some complications introduced by contingency.

Metaphysical foundationalists fall into two camps: pluralist and monist. Whilst pluralists hold that there are multiple fundamental entities, monists posit only one. For example, a familiar pluralist foundationalist conception holds that everything that exists depends on the plurality of fundamental mereological atoms – particles that have no proper parts. The recent champion of monist foundationalism is Jonathan Schaffer (e.g. 2010; 2013) who holds that the cosmos is the single fundamental entity, on which everything else depends.

The second position, where asymmetry is accepted but well-foundedness is rejected, is called metaphysical infinitism (e.g. Morganti, 2009). Accepting asymmetry generates chains of grounding where each entity appears only once in the chain, but rather than bottoming out in some fundamental entity, these chains continue infinitely. Defenders of such a view might, for example, hold that reality is infinitely divisible (the world is 'gunky') and that entities at each 'level' of reality are grounded by entities in the level below. Suppose, for example, that macroscopic objects are composed of and ontologically depend on molecules, which in turn depend on atoms, themselves dependent on sub-atomic particles, which depend on smaller sub-atomic particles, and so on ad infinitum.

Note that the above picture is not a straightforward consequence of rejecting well-foundedness and accepting asymmetry. All that is required for well-foundedness to be false is for there to be at least one entity that is neither fundamental, nor dependent on a fundamental entity. We might call the position generated by rejecting well-foundedness and accepting asymmetry 'weak infinitism', to be contrasted with the 'strong infinitism' that is the consequence of endorsing asymmetry along with the converse of well-foundedness:

> **Non-well-foundedness**: for all x, x neither is grounded by some fundamental entity or entities, nor is itself a fundamental entity.

For simplicity, my discussion here concerns strong infinitism.

Again, there is a helpful analogy with infinitism in case of epistemic justification. Infinitists about justification hold with the foundationalist that justification is inferred

through linear chains of reasoning, but maintain that any termination of the chain is arbitrary. There is no last reason in the series, and no belief can appear twice in the same chain of reasons. Beliefs are justified when they are part of a non-terminating, non-circular series of reasons (see e.g. Klein, 2005).

The third available position is metaphysical interdependence, which rejects both well-foundedness and asymmetry. According to this view, some entities are such that they are not grounded in anything fundamental, and some entities are such that there is mutual ontological dependence between them. Imagine, for example, a world containing only a circle and its pair of semi-circles. It might be that at that world, the circle is grounded in the semicircles that compose it (a 'metaphysical explanation' of the circle cites the semicircles; once we have the semicircles, the circle is 'no addition to being') but the semicircles are also grounded in the circle – their existence derives from the existence of the circle. In this case, my contention is that there is a symmetrical grounding relation between the circle and the semicircles. Since everything at this circle-world is grounded in something else, nothing is ontologically basic; nothing is fundamental. (See §4 for two more detailed examples of symmetrical grounding.)

When there are more objects at a world, the rejection of well-foundedness and asymmetry allows for the possibility of complex grounding networks and grounding loops. Once again, there is a familiar epistemic analogue of this view. Coherentists about justification take a belief to be justified when it is part of a coherent system of beliefs. The coherentist belief system is a network of mutually supporting beliefs where a given belief can appear in its own reason ancestry (and justification is an emergent feature of such networks). Metaphysical interdependence, like coherentism about justification, posits networks of entities where there is no prohibition on entities partially depending on themselves. This is demonstrated in the above case of symmetrical grounding involving a circle and its semi-circles.

But again, just as coherentists posit complex networks of beliefs where a belief usually appears far away from itself in its own reason ancestry, metaphysical

interdependence too recognises that symmetrical grounding may not be immediate. Suppose we have four entities: A, B, C and D, related in such a way that A grounds B, B grounds C, C grounds D and D, in turn, grounds A. Since grounding is transitive, it will also be the case that A grounds, albeit mediately and partially, C, D, and itself. It follows then that if grounding is nonsymmetric and transitive, it is also nonreflexive (because it must be possible for something to ground itself).

As with infinitism, we can distinguish weak and strong versions of interdependence. On the weak conception (as outlined above) there might be some fundamental entities and some parts of linear chains of dependence. A strong version of interdependence endorses non well-foundedness in conjunction with the converse of asymmetry:

Symmetry: for all x and all y, if x grounds y, then y grounds x.

The grounding between x and y might well be partial and indirect, but symmetry entails that for all x and all y, if the metaphysical explanation for y includes x, then the metaphysical explanation for x will include y. This claim is weaker than it perhaps first sounds. Somewhere in the metaphysical explanation of y we will find x, but it might be that the metaphysical explanation includes all the entities at the word where x and y exist (compare the occurrence of a reason Q in a coherentist's belief network that is only cited in justification of some belief P (which is itself partly justifies Q) if every reason in the network is cited in justification of P.

(Note that it is consistent with the strong version of interdependence that all entities are grounded in mutually dependent pairs, and no grounding relations obtain between each pair and any other entity. This strikes me as an unlikely way for the world to be, and it is unproblematic for metaphysical interdependence in the same way as it is unproblematic for the foundationalist that her theory would allow for similarly isolated grounding pairs so long as one member of the pair is fundamental. There are good reasons in both cases to think that the world does not conform to those models.)

For completeness, we should note that a fourth position accepting well-foundedness and rejecting asymmetry is *prima facie* possible. A weak version of this view has it that structures of grounding are always well-founded, but that there might be some

interdependent loops in the well-founded chains. This is very similar to the weak version of interdependence, though less permissive because it requires rather than merely permits that networks of grounding relations are well-founded. A strong version of this fourth position accepts symmetry and well-foundedness, and thus entails that there can be no instances of grounding (whenever two or more entities enter into grounding relations, the grounding between them must be symmetrical, but this has the consequence that there are non-well-founded entities). Since this position precludes any instances of grounding, I do not discuss it further.

3. Nonsymmetric ground and nonsymmetric explanation

The asymmetry of ground has been thought to be a species of the general asymmetry of explanation (see Lowe, 2010). That explanation is asymmetric is a common contention, presumably borne out of the general view that circular arguments are bad arguments, and the intuition that symmetric or circular explanations could not provide us with any new information. Circular explanations are generally unsatisfying, and thus unacceptable. An obvious argument for the asymmetry of ground has the following structure:

(1) Ground is a form of explanation

(2) Explanations are asymmetric

(3) Grounding is asymmetric

The argument is clearly valid, and so anybody who wishes to deny the conclusion in (3) must also deny (at least) one of the premises.

With respect to the first premise, it is at least far from obvious that ground is itself a form of explanation, rather than a relation that is tracked by a certain kind of explanation. This latter position seems to be the view taken by (amongst others) Audi (2012, 119-120) who says 'grounding is not a form of explanation, even though it is intimately connected with explanation...an explanation...is something you can literally *know*; a grounding relation is something you can merely know *about* ', and Schaffer

(2012, 124) who advises that 'one should distinguish the worldly relation of grounding from the metaphysical explanations between facts that it backs, just as one should distinguish the worldly relation of causation from the causal explanations between facts that it backs'. If grounding is not itself an explanatory relation but merely a relation that a certain kind of explanation can track, there need not be any problem with the idea that explanation is asymmetric though grounding relations are nonsymmetric. Any instance of symmetric ground will simply not be tracked by a metaphysical explanation corresponding to it. This is not a particularly surprising result – if explanations must be satisfying and symmetric explanations are always to be considered unsatisfying, then it is reasonable not to expect to find any cases of symmetric explanation, even if there might be symmetric instances of grounding.

But not everyone will be willing to deny the first premise of the above argument. There is a great deal of unclarity and little consensus surrounding how the connection between ground and explanation is to be understood, and many might wish to maintain that ground is indeed an explanatory relation. In any case, it is not necessary to deny the first premise in order to reject the argument's conclusion, since there are also reasons to doubt the second premise.

A familiar criticism of Hempel's influential (e.g. 1965) Deductive-Nomological (D-N) account of explanation is that it seems to licence cases of nonsymmetric explanation. Hempel's account of explanation has it that (i) the explanandum is a logical consequence of the explanans (which must be comprised of some initial conditions I, and at least one law L) and that the explanans must be true. Explanation therefore takes the form of a sound deductive argument, and is to be understood in terms of nomic expectablility; a successful explanation shows that 'the occurrence of the phenomenon was to be expected…and in this sense enables us to understand why the phenomenon occurred.' (Hempel 1965, 337). There are many cases in which we can derive some explanandum E from I and L, but we can seemingly also derive I from E and L. The most oft cited example concerns deriving the length of the shadow s cast by a flagpole from the height h of the flagpole, the angle θ of the sun above the

horizon and laws *l* about the rectilinear propagation of light (see e.g. Woodward, 2014). The apparent problem is that not only can *s* be deduced and from and thus explained by *h*, *θ* and *l*, but so too can *h* be deduced (and thus explained by) *s*, *θ* and *l*. But this seems to conflict with our explanatory intuitions – we shouldn't appeal to the length of a shadow to explain the height of a flagpole.[5]

That many have the intuition that explanation *is* asymmetric is one reason that causal theories of explanation have become popular. Though we can deduce *h* from *s*, *θ* and *l*, it is (arguably) not the case that the length of the shadow could play any *causal* role with respect to the height of the flagpole. Causation, let us suppose, is truly asymmetric. So if we understand explanation as causal explanation, then it comes as no surprise that explanation is indeed asymmetric. But explanations involving grounding are paradigmatically non-causal. The asymmetry of causal explanation lends little support to the claim that metaphysical explanation, and even less so grounding, is asymmetric.

Achinstein (1983, 233-7) gives a number of examples of identity explanations, such as explaining the fact that the pH value of a solution is changing by appeal to the fact that the concentration of hydrogen ions in that solution is changing, or explaining the fact that ice is water by appeal to the fact that ice is composed of H_2O molecules. Achinstein's contention (1983, 236) is that if we want to explain (for example) the fact that ice is composed of H_2O molecules, we might do so by appeal to the fact that ice is water. Achinstein claims that there is nothing intrinsically wrong with this, and that it is possible to explain the presence of a given micro-property by appeal to the presence of an identical micro-property, or vice versa. Such explanations, if they are genuine, force us to admit that explanation is nonsymmetric. In that case, the second premise of the above argument is false.

One further point about the supposed asymmetry of explanation. Circular explanations are considered bad because they fail to provide us with any new

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[5] van Fraassen (1980: 136-7) constructs a story in accordance with which an explanation for the height of a tower (a minor variation on the flagpole) *can* be given in terms of the required length of its shadow (the requirement that the shadow reach a particular spot on the ground at a given time dictates that the tower be built to its specific height). van Fraassen's contention is that explanations are only explanatory relative to a context.

information. We can point out two things here. Firstly, that this is an *epistemic* reason for rejecting circular explanations, and it is far from obvious that this ought to licence a rejection of circles of ground, where the grounding relation is generally supposed to be entirely *metaphysical*.[6] Second, there are cases of holistic explanation which, whilst circular, nevertheless seem satisfying. The following example is from Cling (2002, 262):

I wake in the middle of the night because of what seems to be a loud pop. I look over at the display of my digital alarm clock, but it seems to be off. I go back to sleep, and wake in the morning to a crew from the electricity company working on the transformer across the road. I reason that the transformer blew in the night, and that there did seem to be a large pop and my clock did seem to be off.

The idea is that I am justified in believing that there seemed to be a pop and the clock seemed to be off, but I might nevertheless be mistaken because it is not unlikely that I am misremembering what happened in the night. The transformer blowing (call this (i)) explains both the presence of the power crew (ii) and my experience in the night (iii), but without that night-time experience I would not be justified in believing that the power crew were there to work on the transformer, and not for some other reason. (i) thus explains (ii) and (iii), but it is only on the basis of (ii) and (iii) that I have reason to believe (i). I am now inclined to account for (iii) in terms of (i), rather than thinking I was mistaken about my night-time experience. Holistic explanations are not necessarily bad explanations. This gives us further reason to reject premise (2) of the above argument, and encourages us to look for grounding relations that license holistic metaphysical explanations.

4. Examples of nonsymmetric grounding

The claim that grounding relations are nonsymmetric may seem *prima facie* implausible. This section highlights two extant examples of seemingly symmetric grounding (the first concerning propositions, and the second concerning quantities) in

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[6] This point is made by Barnes (MS), who also points out that circular arguments are valid, and are considered bad arguments for epistemic reasons.

order to dispel that impression.[7] Those who do not buy into the assumptions made in this section may still find the examples somewhat plausible and thereby soften their attitudes towards nonsymmetric grounding.

Propositions: A first example concerns propositions that depend mutually on one another for their truth. Assume that propositions are grounded in their constituents, and are either true or false. The proposition <the Earth is flat> is grounded in the Earth, and the property of flatness. Similarly, the proposition <the proposition that the Earth is flat is true> is grounded in the proposition that the Earth is flat, and the property of being true (assuming that there is such a property). Now take the proposition <P_2 is true> and call it P_1. P_2 is the proposition <P_1 is true>. P_1 is grounded in P_2, and in the property of being true. P_2 is grounded in P_1 (and the property of being true) and so these two propositions exhibit a symmetrical grounding relation between them. (Note that if P_1 is false, its falsity will be grounded in P_2, which is itself grounded in P_1.)

Quantities: A second case of seemingly symmetric grounding borrows an example from Kit Fine (2001, 11).[8] The mass, density, and volume of a portion of a homogonous fluid are interrelated in such a way that the value of any two of the three parameters might be said to ground the value of the other. There appears to be no principled reason for taking any one of the three parameters as derivative of the other two. This constitutes a violation of either the transitivity of grounding, or of the asymmetry and irreflexivity of grounding. The figure below illustrates the (immediate) grounding relations between these parameters (the direction of the arrow is from grounding entity to grounded entity).

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[7] Note that I think there are many more extant examples of nonsymmetic grounding, but in the interest of brevity I include only two.

[8] Fine is not arguing for interdependent grounding with this example. Instead he is arguing against the idea that reduction is a matter of supervenience on the grounds that we cannot say, without circularity, that each parameter is reducible to the value of others.
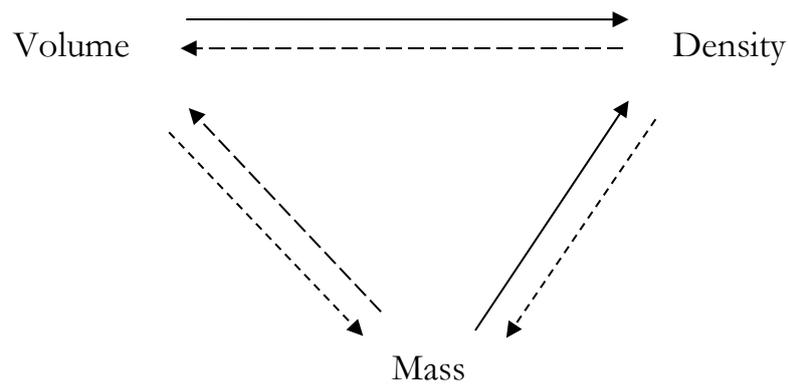
Volume — Density

Mass

Figure 1

If grounding is transitive, then as figure 1 above demonstrates, each of the parameters (partially) grounds both the other two, and itself. If grounding is interdependent, we can embrace the apparent circularity and hold that each of the three parameters is indeed grounded in the other two. This solution is the best fit with our understanding of the relations between these quantities, which seems to dictate that we might reasonably take any two parameters to ground the third.

Though any of the theories or assumptions used to generate these examples might be disputed, none of them is wholly implausible. Since each of them either requires or results in nonsymmetric grounding, I take the examples to show that nonsymmetric grounding is also not wholly implausible. In the next three sections, I consider some positive arguments for metaphysical interdependence. The first is based on intuitions concerning mereology; the second on the permissiveness of different theories of metaphysical structure; and the third on a puzzle about grounding.

5. Part-whole grounding

The argument of this section is that metaphysical interdependence is the only theory of grounding able to reconcile competing intuitions about the dependency relations between parts and wholes. It is common in the literature to hold that the relation between parts and wholes should be considered a relation of grounding (e.g. Schaffer, 2003, 2010; Correia, 2008). Recall that priority monists are foundationalists holding that there is exactly one fundamental entity: the entire cosmos (Schaffer, 2010).

Arguments for priority monism uncover compelling intuitions about the priority of wholes over parts. At the same time, there is much intuitive force to the idea that complex wholes exist in virtue of the parts that compose them. If we are correct to understand both of these forms of dependence as instances of grounding, we require a view like metaphysical interdependence to make sense of situations such as those described below.

Arguments from emergence (see Schaffer, 2010: 50-57) suggest that we cannot tell a complete story in terms of parts alone. Whilst the metaphysics of entanglement remains controversial, a dominant view of quantum-mechanically entangled systems is that 'properties of the whole contain all that can be said about the local properties of the parts, and *only* these properties of the whole contain all that can be said about the local properties of the parts' (Esfeld, 2001: 252, quoted in Schaffer, 2010: 52).). If there are any genuine cases of emergence, they are cases where it is not possible to reduce the properties of the whole to properties of its constituent parts.

Nevertheless, the intuition that wholes depend on their parts is hard to shake off. Whist it might be the case that there are features of a system that cannot be explained purely in terms of the parts of the system and the relations between them, it is counterintuitive to think that the system does not depend on its parts at all. After all, the system is made up of its parts. It is the system that it is at least partly in virtue of having the parts that it has.

A similar situation arises concerning complex organisms and their organs. It seems as though it is in the nature of the organs of an organism to play the role they play as parts of that organism – their nature seems to derive from the nature of the organism (see Schaffer 2010, 47). At the same time, there is much intuitive force to the idea that an organism depends on its organs just as other complex wholes exist in virtue of the parts that compose them. Whilst the organs of an organism derive their nature from the organism, the organism requires its organs in order to exist and to be that organism. Metaphysical interdependence offers a way to reconcile these competing intuitions. If the grounding relations between parts and wholes are symmetrical, then

we are able consistently to maintain both that wholes depend on their parts, and that parts depend on their wholes.

6. Gunk and junk

The second argument for metaphysical interdependence again draws on the claim that that the relation between parts and wholes is one of grounding, and concludes that only metaphysical interdependence is capable of reconciling the metaphysical possibilities of both gunky and junky worlds.

Gunky worlds are those at which everything has proper parts. Junky worlds are those at which everything is a proper part of something. Both junk and gunk appear to be metaphysically possible (see discussions in, for example, Sider 1993; Hudson 2007; Varzi 2009; Schaffer 2003, 2010; Bohn 2009a, 2009b) but foundationalists will be unable to account for both possibilities. Other things being equal, a theory about grounding that is compatible with both gunk and junk will be preferable, but foundationalists are unable to provide such a theory. This criticism is strongest against the foundationalist who takes foundationalism to be necessary if true. (It is open to the foundationalist to claim that foundationalism might be merely contingently true (as in Cameron, 2008), and thus that the mere metaphysical possibilities of gunk and junk are not troubling. In that case the onus is on the defender of foundationalism to explain why we should expect these metaphysical theses to hold contingently. In any case, my argument here can be restricted to the actual world, where there are not yet decisive reasons to think that the world is not gunky, junky, or both ('hunky').)

Pluralist foundationalists holding that the multiple fundamental entities are whatever is the smallest unit of reality (e.g. mereological atoms) have a problem accounting for gunky worlds. In gunky worlds everything is divisible, and thus there will be no smallest unit of reality, and so no fundamental entities to ground reality. The pluralist foundationalist in this scenario holds that each entity depends on its parts, and since there is no entity that does not have any parts, there are no non-dependent entities; everything is grounded in something. Since the foundationalist holds that everything is

either fundamental (i.e. ungrounded) or grounded in the fundamental, gunky worlds are incompatible with their theory.

It is at least *prima facie* possible to be a pluralist foundationalist and hold that the fundamental entities are not those with no parts, but might be the medium-sized dry goods with which we are familiar from our everyday interactions with the world. A foundationalist of this stripe holds that all of the rest of reality depends on those fundamental macroscopic entities for its existence and nature, and this foundationalist therefore does not have a problem with gunky worlds (everything is grounded in the medium-sized dry goods). Reality might be infinitely divisible, but grounding chains nevertheless terminate, radiating inwards towards the familiar macroscopic objects. This kind of view might be defensible, but it is counterintuitive and would require independent motivation. Since I am not currently aware of it having any defenders, I set it aside here.

Schaffer (2010, 61-64) argues that whilst the pluralist cannot account for gunky worlds (which he takes to be both metaphysically possible and consistent with current science) the foundationalist monist can. The monist holds that the entire cosmos is the single basic object in which all of the parts of the cosmos are grounded. Consequently, even if everything has proper parts, all of these parts are grounded in the ultimate whole. But just as the pluralist foundationalist cannot account for gunky worlds, the monist foundationalist will be unable to account for the possibility of junky worlds, because at such worlds there will be no ultimate whole in which to ground reality. Everything is a proper part of some larger object.

In a nutshell, the metaphysical foundationalist will always be unable to simultaneously account for both gunk and junk. This leaves her two options. She must (1) adopt either monism or pluralism and then explain why either gunk or junk respectively is metaphysically impossible (this is the strategy adopted in Schaffer, 2010); or (2) argue that whilst both gunk and junk are contingent possibilities, all the worlds at which pluralist foundationalism is true are non-gunky, and all worlds were monist foundationalism is true are non-junky (and no foundationalist worlds are hunky).

In response to the first option, I have suggested that it is a mistake to deny the metaphysical possibility of either gunk or of junk. In response to the second, we can note first that most take their view of metaphysical structure to be non-contingent, and second that that we could restrict our argument to the actual world. Our best science does not currently militate against gunky worlds, and the scientific debate over the finitude of the universe and philosophical debate over composition are both live. The foundationalist who adopts the second strategy is hostage to empirical fortune over the outcome of those debates.

In contrast, metaphysical interdependence has no problem with worlds that are either gunky, junky, or hunky. Interdependence necessitates neither a smallest particle nor a largest sum, as grounding relations do not form a linear ordering. Where the relevant debates are unresolved, it seems prudent to adopt an account of metaphysical structure that will be consistent with any development in those debates, both concerning the metaphysical possibilities of gunk, junk and hunk, and concerning the structure of the actual world.

Metaphysical interdependence is thus placed than foundationalism to deal with all of the metaphysically possible ways in which reality might be structured. It is also more liberal than strong infinitism, which *requires* that the world be gunky or junky in order to populate its infinitely extending grounding chains.[9]

Interdependence can cope with any finite or infinite numbers of levels of reality, or dispense with them altogether. It can thus remain neutral on these issues, and acceptance or rejection of the view will not turn on any future discovery, scientific or otherwise, about whether reality 'bottoms out' or composition is unrestricted. Interdependence is non-arbitrary in the sense that it does not have to make any stipulations in these areas.

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[9] Note that weak infinitists are also able to accommodate the possibility of either gunky, junky or hunky worlds without requiring that there be infinitely extending chains of grounding.

7. Grounding grounding

The final argument for metaphysical interdependence I will discuss here concerns the ability of the defender of interdependence to respond to a question posed in Bennett (2011) (also addressed in Sider, 2011 and deRosset, 2013) about whether grounding is itself grounded. For the foundationalist, this question becomes a dilemma about whether or not the grounding relation is fundamental. Bennett argues that if grounding is not grounded (i.e. is fundamental) then two compelling principles about grounding are violated.

The first is the purity principle argued for in Sider (2011: 115-6), which entails that connections between the fundamental and the non-fundamental cannot themselves be fundamental. The second is Schaffer's (2010a: 40) principle that the fundamental elements of the world should be open to free modal recombination – since ungrounded entities do not depend on anything else, they should be modally unconstrained. Bennett argues that if grounding is fundamental, then there is a possible world w just like this one in terms of the distribution of all the rest of the fundamental entities, except that nothing grounds anything else. Any actually grounded entity must, in w, either fail to exist or be fundamental, and neither option is plausible (cf. Bennett 2011: 27).

On the second horn of the dilemma, grounding is grounded. The problem with this solution is easiest to see when put in terms of grounding facts (though see Bennett's paper for a discussion in terms of relations). Suppose it is a fact that P grounds Q. If grounding is grounded, then some fact (call it A_1) grounds the fact that P grounds Q. Now we have a second grounding fact in need of a ground; some further fact (call it A_2) grounds the fact that A_1 grounds the fact that P grounds Q. But some further fact must ground the fact that A_2 grounds (A_1 grounds (P grounds Q)). Regress threatens, but if foundationalism is true then the regress is intolerable.

Bennett's proposed solution is to grasp this second horn of the dilemma, but to argue that the regress generated is benign. For each iteration of grounding grounding question, Bennett (2011: 34) contends that the answer is the first relatum of the

grounding claim. It is P that grounds the fact that P grounds Q, P that grounds the fact (A_1) that grounds the fact that P grounds Q, and so on. There is a regress of grounding facts, but the regress is itself grounded in a way that is compatible with foundationalism.[10]

I find the bootstrapping in Bennett's proposal unsatisfying. When we ask for the ground of the grounding fact, we want to know in virtue of what the grounding relation between P and Q obtains. To learn that it is P that grounds that fact, and furthermore that it is P that grounds the fact P grounds that fact, leaves us feeling as though we have not been given a proper explanation. Compare a child who asks why she has to go to bed, and is told 'because I said so'. If she asks 'but why do I have to go to bed because you said so?' and again receives the answer 'because I said so' -- we can sympathise with her indignation. I feel a similar indignation in the face of Bennett's answers to questions about grounding grounding.

Indignation is of course no substitute for argument, but I think its root is in the feeling that the explanation offered is somehow incomplete. This is best seen by way of an example. True disjunctions are said to be grounded in their true disjuncts, so, when P is true, the disjunction P∨Q is grounded in P. When we ask what grounds the grounding fact, Bennett replies again 'P'. But this doesn't seem right. It is not just P that grounds the grounding fact, but P along with a further fact about disjunction: that the truth of a single disjunct is sufficient for the truth of the disjunction. In citing just P we give an incomplete explanation.

DeRossett (2013, 21) responds to this sort of objection by claiming that these further facts should not be considered part of the explanans. It might be that an adequate explanation must make its explanandum intelligible to an audience, and that in order to do so more features of the explanatory story than just the explanans must be mentioned. When we apply this to the example above, we might think that that an adequate explanation must make intelligible the relation that holds between P and P∨Q, and that P by itself is not sufficient to do so. In order to make that relation

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[10] A similar suggestion is offered in deRossett (2013).

intelligible we may have to cite some further facts, but deRosset's point is that these are merely ancillary material, needed only to deliver the relevant epistemic payoff to an audience. They are not themselves part of the explanans.

Trogdon (2013) discusses a reply to DeRosset's response, which he attributes to Shamik Dasgupta. Dasgupta accepts that facts about disjunction are not part of the explanans when we metaphysically explain P∨Q in terms of P, but claims that it does not follow that they are not part of the explanans when it is the fact that P∨Q is grounded in P for which we seek a metaphysical explanation. He argues for this claim by analogy: When we prove P∨Q from P there is no mention of facts about disjunction, but when we prove in the metalanguage that P implies P∨Q, that disjunction introduction is a valid inference rule must be among the premises.

The foundationalist cannot accept any proposal for dealing with the dilemma which involves a regress of grounding facts, on pain of violating the well-foundedness constraint that is characteristic of foundationalism (unless the regress is grounded in a foundational fact/entity as in Bennett's proposal). The defender of interdependence and the infinitist can both claim that grounding relations are themselves grounded. The (strong) infinitist must think that there are infinitely long chains of grounding grounding each grounding relation. The defender of interdependence can offer an alternative (and, I think, more palatable) suggestion.

Entities related by grounding relations enter into complex networks of ground, and the grounds for the fact that *A* grounds *B* are themselves part of that network. Ultimately, it is the network of grounding relations itself that grounds the grounding facts, and the system is itself grounded in the elements that make up the system. This is closely analogous to the way in which beliefs are justified in a coherentist belief system. This somewhat abstract idea can perhaps be better explained with the use of an example.[11]

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[11] This example is of grounding between entities of various ontological categories. I suspect it can be restricted without compromise to groundong between only facts (by exchanging 'P' for 'the fact that P', and so on).

The fact that P grounds P∨Q seems to hold at least partly in virtue of facts about the nature of disjunction. For example, that (in classical logics) the rule of disjunction introduction is such that any disjunct can be added to a truth in a truth preserving way. But the grounds for the fact that disjunction introduction is truth preserving are metalogical facts about the system of which disjunction introduction is a part, specifically that classical logic is sound (i.e. that any deductively valid argument is semantically valid). But what grounds the fact that classical logic is sound is presumably (at least in part) the rules of inference that make up the system, one of which will be disjunction introduction. Since the nature of disjunction introduction was itself amongst the grounds for the fact that P grounds P∨Q, the question about grounding grounding has an answer consistent with interdependence, and not with foundationalism or infinitism. (Of course, the example here does not concern iterations of the grounding question, though it could. The next iteration of the question would be 'what grounds the fact that disjunction introduction (partially) grounds the fact that (P grounds P∨Q). I suspect that answers to that question would draw us further into a web of interdependence.)

Or take different example, this time where we ask two iterations of the grounding question before the interdependence in the answer becomes apparent. Suppose that *y* is a table, the *x*s are the molecules that compose the table, and the *x*s ground *y*. What grounds the fact that the *x*s ground *y* will presumably include facts about the spatiotemporal arrangement of the *x*s (since had they been differently arranged, they would not ground *y*). What grounds the fact that the spatiotemporal arrangement of the *x*s (partially) grounds the fact that (the *x*s ground *y*) presumably has something to do with the laws of composition. And those laws, plausibly, are grounded in their instances. Because the grounding of *y* in the *x*s is an instance of composition, there is a circular grounding chain leading, as part of a network, from the original grounding claim through some iterations of the grounding grounding question, and back again.[12]

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[12] Note though that the chain does not lead back to the original grounding entities (the *x*s), but rather to the fact that the *x*s ground *y*.

In these scenarios there are no fundamental elements, and so there can be no violation of either purity or of Schaffer's recombination principle. Metaphysical interdependence thus both avoids the dilemma that confronts the foundationalist, and licences a coherent story about how grounding claims are grounded.

8. Conclusion

Given some plausible assumptions, there are extant cases of symmetrical grounding. Metaphysical interdependence is a theory of grounding that accommodates those examples, along with competing intuitions about dependency. It is consistent with more of the ways reality might turn out to be than its rival theories, and offers a satisfying solution to the problem about grounding grounding. Metaphysical interdependence ought to be taken seriously in the debate over metaphysical structure.[13]

References

Achinstein, P. (1983). *The Nature of Explanation*. Oxford: Oxford University Press.

Barnes, E. (MS). Symmetric Dependence.

Bennett, K. (2011). By Our Bootstraps. *Philosophical Perspectives* 25 (1): 27-41.

Bliss, R. (2011). *Against Metaphysical Foundationalism*. PhD Thesis, University of Melborne.

Bohn, E. (2009a). An Argument against the Necessity of Unrestricted Composition. *Analysis* 69: 27-31.

Bohn, E. (2009b). Must there be a Top Level? *The Philosophical Quarterly* 59 (235): 193-201.

Clark, M. and Liggins, D. (2012). Recent Work on Grounding. *Analysis* 72 (4): 812-823.

Cameron, R. (2008). Turtles All the Way Down: Regress, Priority and Fundamentality. *The Philosophical Quarterly* 58 (230): 1-14.

Correia, F. (2008). Ontological Dependence. *Philosophy Compass* 3 (5): 1013-32.

Correia, F. (2011). From Grounding to Truth-Making: Some Thoughts. In Reboul, A., *Philosophical papers dedicated to Kevin Mulligan* [Online].

deRosset, L. (2013). Grounding Explanations. *Philosophers' Imprint* 13 (7): 1-26.

Esfeld, M. (2001). *Holism in Philosophy of Mind and Philosophy of Physics*. Dordrecht: Kluwer.

Fine, K. (1995). Ontological Dependence. *Proceedings of the Aristotelian Society, New Series*, Vol. 95: 269-290.

Fine, K. (2001). A Question of Realism. *Philosopher's Imprint* 1 (1): 1-30.

Fine, K. (2012a). The Pure Logic of Ground. *Review of Symbolic Logic* 5 (1): 1-25.

Fine, K. (2012b). A Guide to Ground. In Correia F. and Schnieder, B. *Metaphysical Grounding: understanding the structure of reality*, pp. 37-80. Cambridge: Cambridge University Press.

Hempel, C. (1965). *Aspects of Scientific Explanation and other Essays in the Philosophy of Science*. New York: Free Press.

Hudson, H. (2007). Simples and Gunk. Philosophy Compass 2 (2): 291-302.

Jenkins, C. (2011). Is Metaphysical Dependence Irreflexive? The Monist 94 (2): 267-76.

Klein, P. (2005). Infinitism is the Solution to the Regress Problem. In Setup, M. and Sosa, E. (eds.) Contemporary Debates in Epistemology, pp. 131-139. Oxford: Blackwell.

Lowe, E. J. (2010). Ontological Dependence. In Zalta, E. (ed.) The Stanford Encyclopedia of Philosophy [online]. URL = <http://plato.stanford.edu/archives/spr2010/entries/dependence-ontological/>.

Morganti, M. (2009). Ontological Priority, Fundamentality and Monism. *Dialectica* 63 (3): 271-288.

Rodriguez-Pereyra, G. (2006). Truthmaking, entailment, and the conjunction thesis. *Mind* 115 (460): 957-982.

Rosen, G. (2010). Metaphysical dependence: Grounding and reduction. In Hale, B. and Hoffman, A. (eds.), *Modality: Metaphysics, Logic, and Epistemology*, pp. 109-136. Oxford: Oxford University Press.

Schaffer, J. (2003). Is There a Fundamental Level? *Noûs* 37 (3): 498-517.

Schaffer, J. (2009). On What Grounds What. In Chalmers, D., Manley, D, and Wasserman, R. (eds.) *Metametaphysics: New Essays on the Foundations of Ontology*, pp. 347-383. Oxford: Oxford University Press.

Schaffer, J. (2010). Monism: The Priority of the Whole. *Philosophical Review* 119 (1): 31-76.

Schaffer, J. (2012). Grounding, Transitivity and Contrastivity. In Correia F. and Schnieder, B. *Metaphysical Grounding: understanding the structure of reality*, pp. 122-138. Cambridge: Cambridge University Press.

Sider, T. (2011). *Writing the Book of the World*. Oxford: Oxford University Press.

Trogdon, K. (2013). An Introduction to Grounding. In Hoeltje, M., Schnieder, B., and Steinberg A. (eds.) *Varieties of Dependence (Basic Philosophical Concepts)*. Munich: Philosophia Verlag GmbH.

Varzi, A. (2009). Mereology. In Zalta, E. (ed.) *The Stanford Encyclopedia of Philosophy* [online]. URL = <http://plato.stanford.edu/archives/spr2011/entries/mereology/>.

Trogdon, K. (2013). An Introduction to Grounding. In Hoeltje, M., Schnieder, B., and