From Nature to Grounding

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Abstract: *Grounding* is a powerful metaphysical concept; yet there is widespread skepticism about the intelligibility of the notion. In this paper, I propose an account of an entity's *nature* or *essence*, which I then use to provide *grounding conditions* for that entity. I claim that an understanding of an entity's nature, together with an account of how logically complex entities are grounded, provides all we need to understand how that entity is grounded. This approach not only allows us to say what grounds what, it also sheds light on the formal features of the grounding relation. It provides a principled argument for the orthodox view that grounding is irreflexive, asymmetrical, and transitive; but it allows that it may not be well-founded. The resulting approach gives us a powerful framework for understanding nature, grounding, and the relationship between them.

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1 Problems with Grounding

Metaphysics aims to articulate the structure of reality: to discover the dependencies between things, their identities, and the possibilities they afford. In asking how things metaphysically depend on other things, for their identities and for the ways they are, we are asking about how things are grounded: 'investigation into ground is part of the investigation into nature' (Fine 2012, 76). An understanding of grounding has broad applications throughout metaphysics: to the nature of truth and truthmaking (Liggins 2008; Schaffer 2010a), to physicalism about the mind (Fine 2012), to metaphysical fundamentality (Schaffer 2010b), and to what intrinsic properties are (Barker and Jago 2015; Rosen 2010). So it is no surprise that the last few years have seen an explosion of philosophical literature on grounding. (Bliss and Trogdon 2014; Clark and Liggins 2012; Trogdon 2013 survey the literature.)

All of which is mere waffle, unless we understand clearly what we mean by *grounding*. And, quite predictably, there are those who think we don't have any clear grasp on the notion. Daly (2012) argues that the notion is incoherent. Hofweber (2009); Koslicki (2015); Sider (2011); Wilson (2014) are all skeptics of some kind about grounding.

The dilemma for the grounding fans is familiar. It won't be enough to claim some 'intuitive' grasp on the notion of grounding, for objectors will simply claim not to have those intuitions. (And even gung-ho grounding fans will have to concede that those intuitions are vague and limited in scope.) Nor does it seem

easy to define a suitable notion of grounding from accepted concepts. If we could (say, by cobbling together some modal notions), then we could hardly claim that *grounding* is at the heart of the metaphysical enterprise. (And indeed, grounding is supposed to help us in areas where pure modal notions, such as *supervenience*, have trouble: truthmaking and the nature of mental states come to mind.)

The underlying complaint is that there's no way to understand the general features of grounding. The clearest examples are the simple logical cases: conjunctions are grounded by their conjuncts (taken together); disjunctions by their disjuncts (individually or together, accordingly); and existentials by their instances. (This applies equally whether we're discussing logically complex propositions or logically complex facts.) But, the worry runs, there's just no way we can scale that understanding up to the general case. The real world is messy and complicated, and quite unlike the neat cases of the logical connectives.

I'm going to suggest an approach to grounding on which these logical cases take centre stage. We can develop both a general theory of grounding and a theory of how particular things are grounded. The key link between the simple logical cases and the difficult ones—involving material objects, mental states, truth, and so on—concerns the natures of those entities. I'll argue for a certain view of what makes those entities what they are, and then show how this provides us with information on how they are (or could be) grounded. If we can get a grasp on the natures of things (in the sense to be articulated below), then the simple logical cases give us what we need to understand the grounding conditions for those entities.

2 Nature and Grounding

In many cases, there is a very appealing connection between a thing's nature and the ways in which it is grounded. (Some authors talk of *essence* in place of *nature*. I'll use the two terms interchangeably.) The most straightforward of these are the 'easy' logical cases mentioned above. It is of the nature of being a conjunctive entity (in general) that a conjunctive entity obtains in virtue of both its conjuncts obtaining. So it is the nature of that entity which grounds its *grounding condition*: that conjunctive entities are grounded by their conjuncts.

Much the same goes for disjunctive entities. It is of their very nature that they obtain in virtue of either disjunct obtaining (or both). Their grounding condition is grounded in the nature of what it is to be a disjunctive entity. And again for existential entities. It is of the very nature of an entity *that there is something such that A* that it be grounded by any of its instances: any entity *that Ac*. This grounding condition is itself grounded in the nature of what it is to be an existential entity.

On the theory I'm proposing here, we treat these cases as instances of a general

connection between a thing's nature and its grounding conditions. (Clearly, the logical cases don't provide a sound inductive base for the general claim. They provide the clearest instances of what I take to be a general feature. But to evaluate the general claim, you'll have to consider the theory on its overall merits.) On this theory, the thing's nature specifies its grounding conditions. Given the natures of some class of entities, we can then define the grounding relations which hold between them. (Compare Rosen's (2015, 198) *Grounding-Definition Link* principle, which operates in the opposite direction: from grounding to nature/real definition.) If every non-fundamental entity has a nature of this kind, completely specifying grounding conditions for those entities, then we may hope to have achieved an understanding of grounding in terms of nature. It is equally true on this account that, given all the grounding facts for a particular entity, we can thereby say what its nature is. Our understanding of nature and grounding is intertwined, on this approach. (So scepticism about the coherence of talking about natures would similarly infect grounding talk. I hope to allay some worries along these lines in §5, by taking natures to be constructions, of a certain kind, from common-or-garden properties, relations, and states of affairs.)

Fine (2012) cautions against any such reductive temptation:

> [I]t seems to me that there is a similar error – but writ large over the whole metaphysical landscape – in attempting to assimilate or unify the concepts of essence [i.e., nature] and ground. The two concepts work together in holding up the edifice of metaphysics; and it is only by keeping them separate that we can properly appreciate what each is on its own and what they are capable of doing together. (Fine 2012, 80)

There is what a thing is—its nature—and then there are the ways in which it is grounded. These notions are distinct, each irreducible to the other. (Fine (2015b) revises this opinion, and provides a framework in which 'the two notions thereby complement one another' (2015b, 296). But this approach is rather different than the one I will develop here.)

But suppose, with Fine (2012), that nature and grounding are independent of one another. Then we can make sense of holding fixed some x's nature whilst altering whether some possible y is a possible ground for x. But I don't think that makes sense. It clearly doesn't make sense in the simple logical cases: given what disjunction is, we can't avoid a disjunction being grounded by its disjuncts (individually or collectively). I'll argue below (§5) that, in general, natures are logically complex constructions. Given that understanding of what natures are, the point automatically generalises to cover natures in general.

Can't priority monists (Schaffer 2009; 2010b) and their pluralist opponents agree on what some whole is, but disagree on whether it grounds or is grounded in its parts? No: they must disagree on the nature of being a whole. As I see things, we define *mereological summation* as a kind of worldly conjunction of entities:

$a \sqcup b$ is made up of a and b (and all their parts, but no more), taken together. (I discuss the issue further in §3.) If that's right, then the issue of part/whole priority goes with conjunct/conjunction priority. And, as indicated above, I see no sense in claiming that conjunctions are not grounded by their conjuncts.

Here's a further argument in favour of my proposed nature-grounding link. Everything is either grounded or else is fundamental. (Grounding skeptics should agree. 'Fundamental' means 'not grounded'; so, if there's no grounding, then everything is fundamental.) That includes facts about grounding. But no grounding fact is fundamental, since each involves some grounded, hence non-fundamental, entity. So all grounding facts must themselves be grounded, ultimately by something fundamental (Bennett 2011). I suggest that the only entities that could play this role are the fundamental natures.

Clearly, some natures are fundamental. There's no further explanation of why conjunctions are grounded in their conjuncts other than: that's what it is to be a conjunction. The nature of conjunction is fundamental. Such fundamental natures are best placed to serve as the ultimate grounds of grounding facts. But if grounding is (or is correlated with) a kind of metaphysical explanation, as is often supposed, then there is a kind of metaphysical explanation of grounding in terms of nature.

The strategy I have in mind for linking grounding to nature goes like this. First, we set out how conjunctive, disjunctive, and existential entities are grounded. (I'll discuss the plausibility of logically complex entities in §4.) Next, we associate each non-fundamental entity x with a logically complex entity, x^*. This is a recursive process, bottoming out in logically complex entities whose non-logical constituents are all fundamental. We have already have an account of grounding for all such x^*s. So, if we can assign an x^* to each non-fundamental x, we need only add this: x is grounded in just the way x^* is.

My strategy is to treat x^* as x's nature. (Fine (1995, 55) calls this an 'algebraic' approach to essence/nature.) I'll claim that there is a way to understand the nature of an entity which provides us with a suitable construction x^* for each non-fundamental x. So that is the plan: first, to treat an entity's nature as a structured, logically complex construction, and then to understand grounding for that entity in terms of its associated construction.

3 Real Definition as Formal Constitution

Why would I want to understand the nature of an entity in terms of some logically complex construction? I'm going to draw on the analogy between nature and definition, brought to prominence in contemporary philosophy by Fine (1994) and Lowe (2012). On Fine's view,

> the activities of specifying the meaning of a word and of stating what an object

> is are essentially the same; and hence each of them has an equal right to be regarded as a form of definition. (Fine 1994, 14)

What goes for linguistic definition goes for real definition: the definiens gives the nature of the defined entity. A real definition tells us what the object is (or what it would be): it gives us the object's nature. In giving that nature, we give 'a proposition which is true in virtue of the identity of the object' (Fine 1994, 13). In a similar vein, E. J. Lowe says,

> A real definition of an entity, *E*, is to be understood as a proposition which tells us, in the most perspicuous fashion, *what E is* – or, more broadly, since we do not want to restrict ourselves solely to the essences of actually existing things, *what E is or would be*. (Lowe 2012, 104–5)

My proposal is to use this notion of nature-as-real-definition to provide *grounding conditions* for an entity, by taking the definiendum to be grounded just in the ways the definiens is grounded. We assign the conjunctive condition *being unmarried and being a man* to *being a bachelor*, the former being the real definition of the latter. We've already said that the conjunction *being unmarried and being a man* is grounded by its conjuncts, working together. So the grounds for something's being a bachelor are any ground for its being a man, together with any ground for its being unmarried. This is not a complete analysis of those grounds, in terms of fundamental reality. That would require analysis of the nature of *being unmarried* and *being a man*. The claim is that each such non-fundamental entity has a nature, understood as a logically complex structure on the model of real definition.

The claim here is not that *we* can always give a definition of an entity. As I see things, a real definition is not merely a proposition describing the essential features of the entity in question. Rather, a real definition associates an entity with a construction from more basic entities. (Rosen (2015) offers a similar concept of real definition, as 'a structured complex, built from worldly items in roughly the sense in which a sentence is built from words' (2015, 198).) Given the basic, fundamental constituents and the logical modes of construction (which I'll discuss in §4), the constructions thereby exist, independently of us. Our task, on this way of looking at things, is to articulate how the logical modes of construction work, and how the resulting constructions relate to the entities with which they are associated by real definition.

In general, the entity in question is not numerically identical to the construction associated with it by real definition. (I'll discuss whether there is numerical identity in special cases in §5.) The construction set out in a real definition constitutes the nature of the defined entity, which makes it the very thing it is. This is what Fine calls a *constitutive*, in contrast to a *consequential*, notion of nature. The former, but not the latter, 'is directly definitive of the object' (Fine 1995, 57). Now, this kind

of constitution is not the kind we mean when we say a house is made of bricks. In that case, we are talking about the house's *material constitution*. We can contrast this with a thing's *formal constitution*. A thing's material constitution is usually inessential to that thing's identity. The house can have its bricks replaced bit-by-bit over time, or have a wall knocked, but it remains the same house. (Moreover, many entities have no material constitution: properties, numbers, pure sets, and perhaps mental states. They nevertheless have natures.) By talking about a thing's formal constitution, we point to the way other entities fix that thing's nature. A thing's formal constitution is its nature: a construction from fundamental entities via logical constructors, as set out in the entity's real definition. So, on this picture, an entity has both a material and a formal constitution. The former is the entity's matter, the latter its nature.

One may object at this point as follows. If entities have both a formal and a material constitution, then they have both formal and material *parts* (or at least *constituents* of some kind). So we require multiple notions of *part*. But there is just one notion of part, the one given by the theory of mereology. A part which is not a mereological part 'is a contradiction in terms' (Lewis 1992, 213). I don't think this objection can be sustained. Multiple notions of parthood are unavoidable. (See also Fine 2010.) For what is a mereological whole, say, $a \sqcup b$? It is an entity whose nature is given by its parts: it is the entity which overlaps whatever overlaps either a or b (but no more). That's the explicit definition of 'sum' in axiomatic mereology. (If the system is extensional, sums are unique if they exist; if there is a universal element, they are guaranteed to exist.) An axiomatic definition of a term counts as a real definition if any does. So *overlapping just whatever overlaps a or b* is of the nature of $a \sqcup b$. But this implies that $a \sqcup b$ essentially has a and b as parts.

No ordinary object is essentially the sum of its parts, in this sense of 'part'. This thin shard of perspex was a part of the coffee table, until I broke it off. Thankfully, the table survived. Since the shard was, but no longer is, a part of the table, we cannot understand the table as the mereological sum of its parts. The shard never was a part of the table in this mereological sense of 'part'. *Ordinary parthood* is not the same concept as *mereological parthood*. But it's a bit rum to think that mereological parthood has nothing to say about ordinary parthood. If that were so, we'd have very little use for the notion of mereological parthood. Moreover, it would be a remarkable coincidence that ordinary and mereological parthood shares their key logical features: both are partial orders, both have pairwise least upper bounds (and probably have generalised least upper bounds too).

So here's a suggestion. To be a material part of something is to be a (mereological) part of its matter. The clay is the statue's matter. Parts of the clay are material parts of the statue. Statue and clay agree on all their material parts, and hence on their physical microstructure, their mass and so on. (That's

why both together don't weight twice as much as taken individually!) But statue and clay differ in their formal constitution: only the former has *being a statue* as a constituent of its nature. By contrast, each little portion of clay is a mereological part of, hence essential to, the lump of clay as a whole. But none of them, taken individually, are essential to the statue, since none of them are mereological parts of its nature. They are not written into it by definition. (The statue must have material parts, of course; but it needn't have any particular material part.) Together, those parts materially constitute but do not formally constitute the statue. It's these differences that underly the modal differences between (and in particular, the different persistence conditions of) the statue and the clay.

This notion of *material part* doesn't yet capture what I above called *ordinary part*. My hands are parts of me (in the ordinary sense of 'part'), but they're neither formal nor material parts of me. They're not parts of my nature, but neither are they parts of my matter, for they too do not have their material parts essentially. (Shedding skin cells doesn't change your hand's identity.) So let's say that one ordinary object is an ordinary part (that is, part-in-the-ordinary-sense) of another ordinary object when the former's matter is a (mereological) part of the latter's. Then my hand is an ordinary part of me. Just what counts as an ordinary object is left open. Perhaps the notion is conventional, response-dependent, or otherwise a secondary quality. The proposal tells us what ordinary parts are, whatever we might count as an ordinary object. If there are none, or if every material object is one, then no problem.

On this suggestion, we understand 'material part' and 'formal part' (or 'part of —'s nature') in terms of the underlying mereological notion of parthood, coupled with an independent characterisation of a thing's matter and its nature. This provides a strict notion of being part of a thing's nature. But a nature is a construction—a sentence of our worldly language—which has constituents other than its (mereological) parts. The constituents of an entity's nature stand to its (mereological) parts much as the states of affairs a proposition is about stand to its truthmakers. In the case of propositions, we might adopt the following principles. A negated proposition $\langle \neg A \rangle$ is about whatever $\langle A \rangle$ is about; and both $\langle A \wedge B \rangle$ and $\langle A \vee B \rangle$ are about whatever $\langle A \rangle$ is about plus whatever $\langle B \rangle$ is about (Fine 2015a; Yablo 2014). The same goes for the constituents of worldly sentences, and hence for essences: *that* A and *that* $\neg A$ share their constituents, as do *that* $A \wedge B$ and *that* $A \vee B$. (This brings out one way in which the analogy with subsentences breaks down: $\neg\neg A$ and A differ in their subsentences, whereas *that* $\neg\neg A$ and *that* A do not differ in what they are about.)

4 The Language of Reality

In the previous section, I set out two metaphysical tasks needed by the theory of nature as formal constitution. The first is to articulate how the logical modes of construction work. The second is to understand how the resulting constructions relate to the entities with which they are associated by real definition. I'll deal with the first in this section and the second in §5. Once we have done that, we will have a clearer picture of how all this helps us understand grounding.

A key ingredient of my approach is that an entity's nature is a construction from more basic entities. Above, I spoke of natures as *logical constructions*. So let's clear up one misunderstanding right now: these are not linguistic, conceptual, or mental entities. On my view, there is logical complexity in the world, not only in our thoughts and language. The constructions in question include logically complex states of affairs and logically complex properties. I'll explain these constructions in the remainder of this section, and then put them to work in §5.

Are logically complex states of affairs at all plausible? I think they are. I've argued elsewhere (Jago 2011; Barker and Jago 2012) that there are good metaphysical reasons to believe in negative states of affairs. They are causally efficacious: the fact that the US and UK governments did not properly regulate their banks is a partial cause of the 2008 global financial crisis. They are perceptible: Kevin Peterson played the switch hit against Muttiah Muralitharan because he saw that there was no fielder at cover. And they enter into the constitution of material objects: a ring-doughnut isn't a ring-doughnut unless it features some doughnut-dough surrounding an absence of doughnut-dough. And if one has a prior reason for accepting truthmaker maximalism—the view that every truth has a truthmaker—then negative states of affairs become a highly welcome addition to one's ontology.

So what are negative states of affairs like, metaphysically speaking? Suppose you believe in positive states of affairs, and take them to have constituents: particulars, properties and relations. Somehow, those constituents get together to form a state of affairs. We can't account for this merely by throwing a further relation of *instantiation* in. That just gives us more potential constituents, whereas what we want to know is how they bind together to form a state of affairs. Armstrong's (1997) response is that there must be some form of composition other than the usual mereological, part-whole one. This is *non-mereological composition*.

Now, there's pretty much nothing we can say about the metaphysics of non-mereological composition, other than this: the non-mereological composition of a property and a particular, F and a, gives us the state of affairs *that a is F*. *Non-mereological composition* has to be taken as a metaphysically primitive notion. We have to take it on its own terms, and if we don't like doing that, we have to do without it all together. Suppose we adopt the notion, even though we

can't explain it further. If it's ok to accept a primitive notion of non-mereological composition which takes F and a and gives us the state of affairs *that a is F*, then it can't be intrinsically objectionable to accept a further primitive notion of non-mereological composition which takes F and a and gives us the state of affairs *that a isn't F*. If the first accounts for *instantiation*, then the latter accounts for *anti-instantiation*. Introducing two primitive notions is more costly than accepting one, of course. But that's a relative cost, to be evaluated against the good work that negative states of affairs may do for us in our theory. That's the line we take in Barker and Jago 2012: if we can accept Armstrong-style positive states of affairs via non-mereological composition, then there's no absolute objection to also accepting negative states of affairs.

What of other logically complex states of affairs? In Barker and Jago 2012, we take conjunctive states of affairs to be mereological sums of their conjuncts. So given prior acceptance of atomic states of affairs, acceptance of conjunctive states of affairs is unexceptionable. But if we also have the kinds of negative states of affairs I propose in Jago 2011, then we also have disjunctive states of affairs. They are identified with negative conjunctions via the usual De Morgan equivalence: the disjunctive state *that* $A \vee B$ is identified with the negative conjunctive state *that* $\neg(\neg A \wedge \neg B)$.

When it comes to existential and universal states, we have some options. ? takes an existential state to be a possibly infinite disjunction: *that* $\exists x Ax$ is the disjunction of all states *that* Ac, for all c such that Ac. Similarly, universal states are possibly infinite conjunctions. For this to be at all plausible, we'd need to consider disjunctions and conjuncts which include merely possible states. After all, it could be that something is F, even if none of the actual Fs are Fs. In that situation, the existential state *that* $\exists x Fx$ exists, but the disjunctive state *that* $Fa_1 \vee Fa_2 \vee \cdots$, where $a_1, a_2, \ldots$ are all the actual Fs, would not. Similarly (for some choice of F and G), it could be that all the actual Fs are Gs without all Fs being Gs, for there could have been more Fs than there actually are, which needn't be Gs. We avoid these worries if we treat existential and universal states as infinite disjunctions and conjunctions which involve merely possible as well as actual particulars. But that is quite a commitment. It would be preferable if logically complex states didn't require us to accept that merely possible entities exist.

The solution in Barker and Jago 2012 is to invoke a higher-order property of *being instantiated*. F is instantiated just in case something is F. So the positive state *that F is instantiated* can play the role of the existential state *that something is F*, and the negative state *that F isn't instantiated* can play the role of the negative existential state *that nothing is F*. We then capture the universal state *that everything is F* in terms of the negative existential state *that nothing is non-F*.

This approach gives us a rich ontology of logically complex states of affairs.

We can say much the same about complex properties and relations. In general, we can conceptualise a complex property or relation as a complex state of affairs with gaps in place of particulars. (See Jago 2011 for the technical details.) Complex properties and relations stand to complex states of affairs much as open sentences stand to closed sentences.

We can consider this rich ontology as constituting a worldly language. The natures of particulars, properties, and relations act as names and predicates of the language. Each is interpreted as referring to the entity of which it is the nature: my nature is the name for me, *being human*'s nature is the predicate for *being human*, and so on. Positive non-mereological composition is interpreted as concatenation of terms into sentences; negative non-mereological composition as concatenation of terms preceded by a single negation; and conjunction, disjunction, and existential quantification are interpreted as above. (This is something like Lewis's (1986) *Lagadonian worldmaking language*, stripped of its ersatz connotations.)

The nature of reality is written in this worldly language. Worldly vocabulary is combined into complex names, predicates and sentences, which are the natures of derivative particulars, properties and states of affairs. This is the sense in which the nature of reality is a logical construction from fundamental entities.

One issue raised in this discussion is: just what are the primitive non-logical constituents, the non-logical 'vocabulary', from which this language is constructed? These are the terms which admit of no further definition. As they have no logical constitution, our theory accords them no grounding condition. It treats them as ungrounded, and hence as fundamental, entities. Strictly speaking, our theory says only that *if* there are such primitive pieces of non-logical vocabulary, then they are the fundamental entities. I don't see that our general notion of a logical construction requires there to be primitive non-logical vocabulary. (I come back to this issue in §6.) All well and good, I say: theories of nature or grounding should leave open what fundamental reality is like, or even whether there are any fundamental entities.

Nevertheless, it often helps to have some idea of what fundamental reality might be like, on the theory proposed. Fundamental reality might be a distribution of properties over spacetime. This distribution may be atomist in nature—a scattering of distinct qualitative entities—or it may be a holistic affair, in which a single distributional property gets together with spacetime as a whole to form a single fundamental state of affairs. If the former, then atomistic fundamental properties will serve as primitive predicates. If the latter, then the primitive predicates will be aspects of the big fundamental distributional property. Perhaps there are objects at this fundamental level of reality; perhaps not. (I suspect not: see Barker and Jago 2015; Jago 2016.) Perhaps it's not physical *spacetime* that we find at this level, but some other kind of space: phase space or configuration space.

(Here's a general principle I find attractive: we should adopt as the fundamental

space of our metaphysical theory whatever kind of theoretical space best suits fundamental physical theory. If you object that configuration space is purely a mathematical construct designed for an elegant formulation of current physics, reflect on how we got used to talking about *spacetime*, initially on the basis of some mathematical-physical theory.)

5 Constructing Natures

That's the big picture of how reality is constructed. Each derivative entity has a real definition, written in the worldly language. This is the defined entity's nature: it is its formal constitution, contrasted with its material constitution.

As mentioned above, many entities—including properties, numbers, and pure sets—have no material constitution at all. We might think that such entities are nothing beyond their formal constitution. That is to say, they are numerically identical to their nature, and their parts are their essential properties. On this view, non-fundamental properties are constructions from fundamental properties. They are logically complex predicates, or open sentences, of the worldly language (§4).

A non-material entity is identical to its nature qua formal constitution. Not so for material entities. This raises the question: do we find material entities in the real definitions of other material entities? Or are real definitions in all cases constructed purely in terms of non-material entities? The thing with material entities is that they are contingent beings. Any construction involving a material constituent will likewise be a contingent entity. But real definitions should not be like this. The job of a real definition is to tells us what an entity *is or would be* (Lowe 2012, 104–5). The definition should exist, even if the defined entity does not. So we must take every real definition to be a construction from non-material entities: properties and mathematical entities, say.

Lowe (2006; 2008) objects to this ontic notion of nature and essence, arguing that 'it is simply incoherent to suppose that essences are entities' (Lowe 2006, 3). I think that's wrong. In the linguistic case, we can define a new term from old and, in so doing, we make it mean what it does. The new term has its meaning in virtue of its definition. The definiens, considered as a structured entity built up from more basic meanings, *is* the meaning of the definiendum. The meaning of *bachelor* is built up from the meanings of *unmarried* and *man*. Only on that picture can we say that the meanings *unmarried* and *man* are each parts of the meaning of *bachelor*. So we should take linguistic meanings to be entities. Now, if we follow Fine in holding that 'the activities of specifying the meaning of a word and of stating what an object is are essentially the same' (Fine 1994, 13–14), then we should also view the natures of worldly entities as entities in their own right.

Lowe's specific worry with taking essences to be entities is that

> if the essence of an entity were just some further entity, then it in turn would

> have to have an essence of its own and we would be faced with an infinite regress that, at worst, would be vicious and, at best, would appear to make all knowledge of essence impossible for finite minds like ours. (Lowe 2006, 8–9)

We can deal with this worry. Taking natures to be entities in their own right doesn't commit us to a vicious regress, for we can identify the nature of a nature with itself. The nature of the nature of any x is just the nature of x. The nature of *being a bachelor* is given by the conjunctive entity, whose conjuncts are *being unmarried* and *being a man*. That's just the mereological sum, *being unmarried* $\sqcup$ *being a man*. The nature of that entity is to be the sum with parts *being unmarried* and *being a man* (and all their parts), but no more. But that entity is *being unmarried* $\sqcup$ *being a man* itself. The nature of the nature is just the nature itself. This gives us a neat and non-*ad hoc* response to Lowe's regress worry.

It may be thought that this proposal quickly runs into contradiction, as follows. *Being a bachelor* has *being a material entity* as part of its nature. Yet the nature of *being a bachelor* is a property, and properties are essentially non-material entities. So that nature cannot have *being material* as part of its nature. This implies that *being a bachelor*'s nature's nature is distinct from *being a bachelor*'s nature.

To avoid the worry, we have to pay careful attention to how we ascribe essential properties to a property F, based on F's nature. We must carefully distinguish between what's essential to *possessing* F, on the one hand, and what's essential to F's identity, on the other. Suppose F is analysed as a conjunctive entity, $G \sqcup H$. Then possessing G and possessing H are both essential to possessing F: they are individually necessary (and jointly sufficient) conditions for F-possession. What's essential to F itself – that is, to F's being the very entity it is, rather than some other – is that it has just G and H (and all their parts) as parts. It is of F's nature to have G as a part. That doesn't imply that F possesses G. In just the same way, it's essential to (the identity of) *being a bachelor* that it has *being a man*, and hence *being a material being*, as a part. That implies that *being a material being* is essential to bachelorhood-possession. But that doesn't imply that the property *being a bachelor* is itself a material being, essentially or otherwise.

Given our notion of nature as formal constitution as real definition, the story about grounding is then relatively straightforward. How an entity is grounded can simply be read off its real definition, given that we understand grounding for the logical cases: conjunction, disjunction, quantification and so on. (Rosen (2015, 198) goes in the opposite direction, defining real definition in terms of ground.) Note that this view, combined with our identification of a nature's nature with that very nature, does not imply that grounding is reflexive. A nature specifies its own grounding conditions, but that does not imply that it grounds itself. Indeed, as I'll show in §6, the theory implies that no entity ground itself.

Let's see how the idea might work in practise. Take a non-fundamental property, *floccinaucinihilipilification*. (Say it out loud!) This, according to my dictionary,

is 'the act or habit of describing or regarding something as unimportant'. That definition involves conjunction, disjunction and existential quantification. The claim is that the property *floccinaucinihilipilification* is a logical construction—via conjunction, disjunction and existential quantification—from the more fundamental properties in the definiens (*being an act*, *being a habit*, and so on). They in turn are identified with the worldly constructions given by their real definitions, right down to the fundamental level, if there is one. (Even if there is a fundamental level, the definition nevertheless has the non-fundamental properties *being an act*, *being a habit*, and so on as constituents, just as '$p \wedge q$' is a constituent, but not a primitive constituent, of '$(p \wedge q) \vee r$'.)

We can then read the grounding story for *floccinaucinihilipilification*-possession from its definition. The definition is disjunctive, and so each disjunct gives us a (full) ground for something's possessing *floccinaucinihilipilification*. The first disjunct, for example, tells us that *x's being an act of regarding something else as being unimportant* is a (full) ground for *x*'s possessing *floccinaucinihilipilification*. And since the real definition doesn't 'bottom out' until the fundamental level of reality (if there is one), it also tells us that whatever grounds *x's being an act of regarding something else as being unimportant* thereby also grounds *x*'s possessing *floccinaucinihilipilification*. (More on this in §6.)

Now let's consider an example for which philosophers genuinely want an informative grounding story: pain. Suppose the role-functionalists are right: pain is a property identified (or otherwise closely associated) with a certain causal role, typically taking damage in certain organisms to certain types of behaviour: call that role *R*. What is a causal role? We know how to describe one in terms of typical causal inputs and outputs; but what kind of entity is it? It must be an entity of some kind, else we can't identify pain with it. It must be a complex entity, somehow built from the typical input and output properties: *being physically damaged*, *displaying pain-behaviour* and so on. And there must be some further constituents of the role, signifying the direction of typical causation: a causal role in which pain-behaviour typically causes physical damage would be something else altogether.

It isn't clear what kind of entity those 'typical causation' constituents might be. Here's one suggestion. According to some theorists of dispositions, reality contains a primitive form of modality, somewhere between metaphysical necessity and contingency (Mumford and Anjum 2011a;b). This modality is a *tendency*, and it links various states (or perhaps, events) when the one tends to the other. A dropped-vase state tends to a smashed-vase state; a solid-salt-in-water state tends to a dissolved-salt state. Perhaps these state-linking tendencies obtain in virtue of the essences of the properties (*fragility*, *solubility*) in question; perhaps not. Central to this kind of theory is the idea that at least some of these dispositional tendencies are fundamental. Perhaps *fragility* and *solubility* can be explained in

terms of categorical molecular structure but others—such as *having unit negative charge*—are fundamental and irreducible to categorical properties. So the theory goes.

Making best sense of this kind of theory requires realism about the dispositional tendency itself: the bit of ontology that links states when the one tends to the other. If a state α has a tendency to state β, and a further state γ has a tendency to state δ, then there's something both those dispositional states α and γ have in common: having a tendency (to some state or other). That's what makes them dispositional states (and that's what makes the properties involved dispositional properties.) Realists about properties in general buy this line of argument for ontological commitment: they take 'there's something x and y have in common' as an indicator of ontological commitment. So, on the dispositional account, there is some part of fundamental reality which links states when one tends to the other. Since it is fundamental, it serves as a piece of primitive vocabulary in our worldly language, which we can use to express causal tendencies. That is one way in which our worldly language might be expressive enough to define-up causal roles in which we find causal tendencies, rather than strict causal relationships.

If the causal role R can be expressed in this way in our worldly language, the resulting construction is a metaphysical definition of R, specifying its constituents and how they are put together. The resulting entity is a property (a worldly sentence with a free variable): the property of occupying causal role R. Let's suppose it is a property of states of affairs. (Take it to be a property of events, or of properties, if you prefer to think of causal relata in those terms.) We can then take the property *being in pain* to be the existential property λx(*that some state of x's occupies causal role R*). What, then, grounds my being in pain? We've identified *being in pain* with an existential property. And in general, a ground for an existential state *that something is F* is some particular thing's being F: the state *that a is F*, for example. So what grounds my being in pain involves whatever state of mine occupies causal role R. If this is the state of my C-fibres firing, then the ground is *that my C-fibre-firings occupy causal role R*.

In general, the construction of a thing's nature in our worldly language may be a very complex affair. But given that nature, written in our worldly language, then the grounding-story for that entity will be relatively straightforward. Since that nature is a logical construction, the entity's grounds will be given by the logical cases of grounding set out above.

These clauses give us the *full* ground: each disjunct (on its own) fully grounds a disjunctive state, for example. We can also give a neat definition of *partial ground*. Partial grounds are related to the constituents of a real definition (§3): each constituent of a defined property plays a role in grounding instances of that property. But there is a crucial difference in the notions. *Being married* is a constituent of *being a bachelor*, but it is *not being married* which partially grounds

being a bachelor. A constituent may appear in a definition positively or negatively: *being a man* appears positively, but *being married* negatively, in *being a bachelor*.

So consider the *negation normal form* of a real definition. (This is the worldly sentence obtained from the definition by 'pushing' all negations down the syntax tree via De Morgan and quantifier duality rules, cancelling double negations as we go, until all remaining negations apply immediately to atomic sentences.) Negative occurrences of a state are those that appear negated in the definition; otherwise, an occurrence is positive. Then, *x's being F* partially grounds *y* when the state *that x is F* has a positive occurrence in *y*'s real definition; and *x's not being F* partially grounds *y* when the state *that x is F* has a negative occurrence in *y*'s real definition.

6 The Shape of Grounding

We now have a story about how grounding works. What does it tell us about the shape of the grounding relation? In particular, which formal properties does *grounding* possess? The *standard account* has it that grounding is irreflexive, asymmetric, transitive, and well-founded. On this picture, each grounding chain is a strict order with a least element. (Here I use 'well-founded' to mean that each grounding chain eventually terminates; or equivalently, that every set of entities has a grounding-minimal element. But see Dixon 2016 for a comparison of different characterisations of grounding well-foundedness.) By contrast, Thompson (2016) defends a view she calls *metaphysical interdependence*, on which grounding is non-symmetric. On that view, entities can mutually ground one another. Priest (2014) defends a stronger view: everything plays a role in grounding everything else. Grounding is symmetric, on this view. Schaffer (2012) argues that grounding is not transitive, and Rodriguez-Pereyra (2015) argues that it is not irreflexive, not asymmetrical, and not transitive. Morganti (2009) argues that, whilst grounding is asymmetric, it is not well-founded: every entity is grounded by some other(s), and so there is no fundamental level of ungrounded entities.

The story about grounding I've given here supports irreflexivity, asymmetry, and transitivity; but it does not imply well-foundedness. Let's consider each feature in turn. There are two arguments we can give for the irreflexivity of grounding. The first turns on real definition. A good definition cannot include its definiendum in its definiens. No definition, taken on its own, should be circular. Nor can we offer a package of definitions which, taken together, are circular. Avoiding circularity is part of the success conditions on definitions. Now suppose some x is a partial ground of itself. Then, on our picture, x appears (as a positive constituent) in its own real definition (§5). This makes x's real definition circular. But there can be no such definition, and so there can be no such x. (Note that the conclusion is not that x lacks a real definition. If it did then, on our picture, it

would not have grounds: it would be a fundamental entity.)

The response to this is likely to be that the ban on circular definitions is merely an epistemic requirement, from which a purely metaphysical conclusion cannot be drawn. (Barnes (2015) and Thompson (2016) raise a similar objection to those arguing from properties of explanation to properties of grounding.) But the objection is incorrect: a circular definition is not merely deficient on epistemic grounds. In the linguistic case, a circular definition fails to define a meaning, and so is not a definition at all. It is the nature of such definitions to give the meaning of some term. Something that fails to provide a meaning is just not a definition at all. It is to genuine definitions as rubber ducks are to real ducks. The same goes for real definition. Something that fails to specify what an entity is, is not a real definition at all. This is a purely metaphysical point. Purely on metaphysical grounds, real definitions cannot be circular. So the conclusion stands: nothing (partially or wholly) grounds itself.

A similar argument can be run to establish the asymmetry of grounding. Suppose x partially grounds y and y partially grounds x. Then, by the reasoning above, each appears in the other's real definition. Taken together, we have a circular definition package. But there are no such definitions, and hence there are no such x and y. Grounding is asymmetrical. (Irreflexivity and transitivity entail asymmetry. This direct argument shows that grounding is asymmetric, independently of whether it is transitive.)

The second argument for the irreflexivity (and asymmetry) of grounding turns on the fact that natures are constructions from fundamental entities. If x partially grounded itself, then it would be a constituent of its own nature, and hence a proper (mereological) part of its formal constitution. But, as we saw above (§5), only necessary, non-material entities are constituents of natures. Hence x must be a non-material entity and hence numerically identical to its own formal constitution. This implies x is a proper (mereological) part of itself, which is impossible. So again, no entity partially grounds itself. Again, a similar argument can be used for asymmetry. Suppose x partially grounds y and y partially grounds x. Then, reasoning as above, x is a proper (mereological) part of y and y of x, which is impossible. So again, partial grounding is asymmetrical.

Let's move on to transitivity. This is easily established. Suppose x partially grounds y and y partially grounds z. Then by construction, x's formal constitution is a positive constituent of y's, and y's is a positive constituent of z's (§5). But by definition, each positive constituent of x's formal constitution is also a positive constituent of z's, and hence any partial ground of y is a partial ground of z. It follows that x partially grounds z. So partial grounding is transitive.

The final component of the standard picture of grounding is well-foundedness, which (given asymmetry and transitivity) rules out infinitely descending grounding chains. As far as I can see, the account developed here does not support well-

foundedness. (Neither does it support Dixon's (2016, 8) alternative formulation of well-foundedness, which requires each non-fundamental entity to be grounded by some fundamental entity.)

Suppose that there are possible entities, every (mereological) part of which has proper (mereological) parts. Such entities are *atomless*; they have no smallest parts. Lewis (1991) called such entities *gunk*. Suppose that the nature of a mereological whole is to be the entity with precisely those mereological (proper) parts (§3). (That's plausible, but by no means mandatory.) We might consider the real definition of a particular mereological sum on the model of the formulas we use to specify fusions: $a = b \sqcup c$. (If a is atomless, no such finite (or even countably infinite) formula gets to the whole truth about what a is. But there is no requirement on worldly real definitions to be countable.) Or we might instead consider a real definition of mereological sums in general: they are the entities defined by their (proper) parts. Either way, our theory will then imply that mereological sums are grounded by their (proper) parts (and nothing else). So if gunky objects are possible, then infinitely descending grounding chains are possible too. Object-gunk leads to non-well-founded grounding structures. (And if nothing grounds a whole but its parts, the gunk example would also be a counterexample to well-foundedness in Dixon's (2016) sense.)

Now, I don't claim that the nature-grounding link forces this non-well-founded picture on us. Gunk may be impossible. The natures of mereological sums might not be as I've suggested. So, for all I've said, it may be that grounding is well-founded after all. Either way is consistent with, but not implied by, the nature-grounding link I've proposed.

7 Conclusion

Material objects have both a formal and a material constitution: the former is their nature, the latter their matter. Non-material entities (including properties, relations, numbers and pure sets) have only a formal constitution: they are identical to their natures. In both cases, natures are constructed from more basic constituents via logical constructors. We can conceptualise those constructions as being part of a worldly language. If there is a fundamental level to reality, then it provides the primitive non-logical vocabulary of this language. If there are no fundamental ungrounded entities, then we have a language without primitive non-logical vocabulary.

The association of some entity with its nature takes the form of a real definition. We then read a real definition as setting out grounding conditions. The possible grounds for an entity are specified by its nature, together with the recursive clauses setting out the grounds for conjunctive, disjunctive, and existential entities. We thus have a tight relationship between nature and constitution, on the one

hand, and an entity's logical constituents and its grounds, on the other. On this approach, grounding is irreflexive, asymmetrical, and transitive; but it need not be well-founded.

This approach seems to me to provide a powerful framework for understanding nature, grounding, and the relationship between them. As such, it is worthy of more detailed investigation.

8,105 words

References

Armstrong, D. (1997). *A World of States of Affairs*, Cambridge University Press, Cambridge.

Barker, S. and Jago, M. (2012). Being positive about negative facts, *Philosophy and Phenomenological Research* 85(1): 117–138.

Barker, S. and Jago, M. (2015). Essential bundle theory. unpublished manuscript.

Barnes, E. (2015). Symmetric dependence. http://elizabethbarnesphilosophy.weebly.com/uploads/3/8/1/0/38105685/symmetric_dependence.pdf.

Bennett, K. (2011). By our bootstraps, *Philosophical Perspectives* 25(1): 27–41.

Bliss, R. and Trogdon, K. (2014). Metaphysical Grounding, *Stanford Encyclopedia of Philosophy* p. N/A.

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

Daly, C. (2012). Skepticism about grounding, in Correia and Schnieder (eds), *Metaphysical Grounding: Understanding the Structure of Reality*, Cambridge University Press, Cambridge, pp. 81–100.

Dixon, S. (2016). What is the well-foundedness of grounding?, *Mind* Doi: 10.1093/mind/fzv112.

Fine, K. (1994). Essence and modality: The second philosophical perspectives lecture, *Philosophical perspectives* 8: 1–16.

Fine, K. (1995). Senses of essence, *Modality, morality, and belief: Essays in honor of Ruth Barcan Marcus* pp. 53–73.

Fine, K. (2010). Towards a theory of part, *Journal of Philosophy* 107(11): 559–589.

Fine, K. (2012). Guide to ground, in F. Correia and B. Schnieder (eds), *Metaphysical grounding: Understanding the structure of reality*, Cambridge University Press, Cambridge, pp. 37–80.

Fine, K. (2015a). Subject matter. Talk given at Yablo on Aboutness workshop, Hamburg, 3rd August.

Fine, K. (2015b). Unified foundations for essence and ground, *Journal of the American Philosophical Association* 1(02): 296–311.

Hofweber, T. (2009). Ambitious, yet modest, metaphysics, in D. Chalmers, D. Manley and R. Wasserman (eds), *Metametaphysics*, Oxford University Press, Oxford, pp. 260–289.

Jago, M. (2011). Setting the facts straight, *Journal of Philosophical Logic* 40: 33–54.

Jago, M. (2016). Essence and the grounding problem, in M. Jago (ed.), *Reality Making*, Oxford University Press, Oxford, chapter 8.

Koslicki, K. (2015). The coarse-grainedness of grounding, *Oxford Studies in Metaphysics* 9: 306–344.

Lewis, D. (1986). *On the Plurality of Worlds*, Blackwell, Oxford.

Lewis, D. (1991). *Parts of classes*, Blackwell.

Lewis, D. (1992). Critical notice of D.M. Armstrong's A Combinatorial Theory of Possibility, *Australasian Journal of Philosophy* 70(2): 211–224.

Liggins, D. (2008). Truthmakers and the groundedness of truth, *Proceedings of the Aristotelian Society* 108: 177–196.

Lowe, E. (2006). Metaphysics as the science of essence. Keynote address, Metaphysics of E.J. Lowe conference, Buffalo, NY, 8 April 2006. Available at: http://ontology.buffalo.edu/06/Lowe/Lowe.pdf.

Lowe, E. (2012). Essence and ontology, in L. Novák, D. D. Novotnỳ, P. Sousedík and D. Svoboda (eds), *Metaphysics: Aristotelian, Scholastic, Analytic*, Walter de Gruyter, pp. 93–112.

Lowe, E. J. (2008). Two notions of being: Entity and essence, *Royal Institute of Philosophy Supplement* 62: 23–48.

Morganti, M. (2009). Ontological priority, fundamentality and monism, *Dialectica* 63(3): 271–288.

Mumford, S. and Anjum, R. L. (2011a). Dispositional Modality, in C. F. Gethmann (ed.), *Lebenswelt und Wissenschaft, Deutsches Jahrbuch Philosophie* 2, Meiner Verlag.

Mumford, S. and Anjum, R. L. (2011b). *Getting causes from powers*, Oxford University Press.

Priest, G. (2014). *One*, Oxford University Press, Oxford.

Rodriguez-Pereyra, G. (2015). Grounding is not a strict order, *Journal of the American Philosophical Association* 1(3): 517–534.

Rosen, G. (2010). Metaphysical dependence: Grounding and reduction, in R. Hale and A. Hoffman (eds), *Modality: Metaphysics, logic, and epistemology*, Oxford University Press, Oxford, pp. 109–136.

Rosen, G. (2015). Real definition, *Analytic Philosophy* 56(3): 189–209.
URL: *http://dx.doi.org/10.1111/phib.12067*

Schaffer, J. (2009). On what grounds what, in D. Chalmers, D. Manley and R. Wasserman (eds), *Metametaphysics*, Oxford University Press, Oxford.

Schaffer, J. (2010a). The least discerning and most promiscuous truthmaker, *The Philosophical Quarterly* 60(239): 307–324.

Schaffer, J. (2010b). Monism: The priority of the whole, *The Philosophical Review* 119(1): 31–76.

Schaffer, J. (2012). Grounding, transitivity, and contrastivity, in F. Correia and B. Schnieder (eds), *Metaphysical grounding: Understanding the structure of reality*, Cambridge University Press, Cambridge, pp. 122–38.

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

Thompson, N. (2016). Metaphysical interdependence, in M. Jago (ed.), *Reality Making*, Oxford University Press, Oxford, chapter 2.

Trogdon, K. (2013). An Introduction to Grounding, in Miguel Hoeltje, Benjamin Schnieder and Alex Steinberg (eds), *Varieties of Dependence: Ontological Dependence, Grounding, Supervenience, Response-Dependence (Basic Philosophical Concepts)*, Philosophia Verlag, pp. 97–122.

Wilson, J. M. (2014). No work for a theory of grounding, *Inquiry* 57(5-6): 535–579.

Yablo, S. (2014). *Aboutness*, Princeton University Press.