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Metaphysical Dependence: Grounding and Reduction

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1. INTRODUCTION

This essay is a plea for ideological toleration. Philosophers are right to be fussy about the words they use, especially in metaphysics where bad vocabulary has been a source of grief down through the ages. But they can sometimes be too fussy, dismissing as 'unintelligible' or 'obscure' certain forms of language that are perfectly meaningful by ordinary standards and which may be of some real use.

So it is, I suggest, with certain idioms of metaphysical determination and dependence. We say that one class of facts *depends upon* or is *grounded in* another. We say that a thing possesses one property *in virtue of* possessing another, or that one proposition *makes* another true. These idioms are common, as we shall see, but they are not part of anyone's official vocabulary. The general tendency is to admit them for heuristic purposes, where the aim is to point the reader's nose in the direction of some philosophical thesis, but then to suppress them in favor of other, allegedly more hygienic formulations when the time comes to say *exactly* what we mean. The thought is apparently widespread that while these ubiquitous idioms are sometimes convenient, they are ultimately too 'unclear', or too 'confused', or perhaps simply too exotic to figure in our first-class philosophical vocabulary.

Against this tendency, I suggest that with a minimum of regimentation these metaphysical notions may be rendered clear enough, and that much is to be

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gained by incorporating them into our analytic tool kit. I make this proposal in an experimental spirit. Let us see how things look if we relax our antiseptic scruples for a moment and admit the idioms of metaphysical dependence into our official lexicon alongside the modal notions (metaphysical necessity and possibility, the various forms of supervenience) with which they are often said to contrast unfavorably. If this only muddies the waters, nothing is lost; we can always retrench. If something is gained, however, as I believe it is, we may find ourselves in a position to make some progress.

2. EXAMPLES

The first order of business is to identify our topic, so let's begin with some examples. The point here is not to defend the claims that follow, all of which are controversial, but simply to insist that they are not gibberish, and hence that we must have some sort of grasp of the terms in which they are formulated. Thus a philosopher might say:

- The dispositions of a thing are always grounded in its categorical features (Prior, Pargetter, and Jackson 1982). A glass is fragile in virtue of the arrangement of the molecules that make it up, perhaps together with the laws of chemistry and physics. One of the aims of materials science is to identify the physical bases of such dispositions.
- If an act is wrong, there must be some feature of the act that *makes* it wrong. Any given act may be wrong for several reasons, and some of these reasons may be more fundamental than others. A breech of promise may be wrong because it is a breech of trust, and a breech of trust may be wrong because it is prohibited by principles for social cooperation that no one could reasonably reject. One central aim of moral theory is to identify the most fundamental right- and wrong-making features.[1]

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- If it is against the law to keep a tiger as a pet in Princeton, there must be some constellation of non-legal facts in virtue of which this is so. One of the aims of jurisprudence is to identify in general terms the facts in virtue of which the legal facts are as they are. One distinctive claim of legal positivism is that the grounds of law are wholly social, consisting ultimately in the acts of officials and the social practices in which they are embedded (Hart 1961; Raz 1979). Antipositivists typically maintain that pre-institutional moral facts often play a role in making the law to be as it is.
- There are no brute semantic facts. If Jones means *addition* by '+', there must be some array of non-semantic facts in virtue of which this is what he means

[1] It has been clear at least since Sidgwick and Ross that this project is distinct from the analytic project of saying *what it is* for an act to be right or wrong (Sidgwick 1907; Ross 1930).

(Kripke 1982). These non-semantic grounds for the semantic facts may vary substantially from case to case. A name may mean what it does in virtue of some initial dubbing ceremony; a logical particle may mean what it does in virtue of its inferential role. The metaphysical part of semantics aims to catalog in general terms the various ways in which the semantics facts may be grounded in pre-semantic reality.

These are familiar-sounding claims, and they are all at least superficially intelligible. In each case some philosophically interesting class of facts is said to be grounded in, or to obtain in virtue of, some allegedly more fundamental class of facts, and some discipline is charged with identifying the detailed patterns of dependence. The surface intelligibility of these claims gives us some reason to believe that the idioms of dependence make good sense. This creates a defeasible presumption of intelligibility.

To this we may add: it would be very good if these notions were in fact intelligible, for we would then be in a position to frame a range of hypotheses and analyses that might otherwise be unavailable, and which may turn out to be worth discussing. Again, consider some provisional examples.

- It is sometimes said that meaning is a normative notion (Kripke 1982), and hence that any general case for antirealism about the normative implies antirealism about semantics. What could this mean? It might be the claim that every semantic fact ultimately obtains in virtue of some collection of normative facts, e.g., facts about the norms of 'correctness' for assertoric utterances.
- Some philosophers espouse a naturalistic metaphysics. What could this mean? The naturalist's fundamental thought is that certain peculiar aspects of *our* world—the human world—are not among the fundamental features of reality. Human beings think; most of nature doesn't. Human beings are governed by norms; most of nature isn't. These (more or less) distinctively human aspects of reality may be genuine; but according to the naturalist, they are not fundamental. As a first pass, then, we might identify metaphysical naturalism with the thesis that there are no brute normative or intentional facts, i.e., with the view that every such fact ultimately obtains in virtue of other facts. But of course this is compatible with each normative fact's obtaining in virtue of some other normative fact, and so on ad infinitum; and this is obviously incompatible with the naturalist's vision. Better to say that for the naturalist, every normative fact and every intentional fact is grounded in some constellation of non-normative, non-intentional facts, and if we take the 'in virtue of' idiom for granted, we can say this exactly. Every fact p, we may say, is associated with a *tree* that specifies the facts in virtue of which p obtains, the facts in virtue of which those facts obtain, and so on. A path in such a tree is *naturalistic* when there is a point beyond which every fact in the path is non-normative and non-intentional. A tree is naturalistic when every path

in it is naturalistic. Metaphysical naturalism is then the thesis that every fact tops a naturalistic tree.

- Some properties are intrinsic, others extrinsic. How is this distinction to be drawn? There are numerous proposals, most of which seek to explain the notion in modal terms; but none is clearly adequate to the intuitive contrast. If we take the 'in virtue of' relation for granted, a straightforward proposal presents itself. Recall that one intuitive gloss on the contrast has it that a property F is intrinsic iff whether or not X is F depends entirely on how things stand with X and its parts, and not on X's relations to things distinct from X. If we read 'depends' in this formulation as a nod to the 'in virtue of' relation, we can make this idea explicit as follows:

  F is an intrinsic property iff, as a matter of necessity, for all x:

  > If x is F in virtue of φ(y)—where φ(y) is a fact containing y as a constituent—then y is part of x; and
  >
  > If x is not-F in virtue of φ(y), then y is part of x.

  (The last clause ensures that *loneliness*—the property a thing has when there are no things distinct from it—is not deemed an intrinsic property.)

- Some philosophers believe that the aim of ontology is not simply to say what there is, but rather to say what *really* exists, or what exists in the most fundamental sense (Dorr 2005). Such philosophers may say: Of course the lectern exists; it's a thing; it's real. But it is not an *ultimate* constituent of reality; it is not *ontologically real*. What could this mean? Here is one possibility. Say that a fact is fundamental (or brute) if it does not obtain in virtue of other facts, and that a *thing* is fundamental if it is a constituent of a fundamental fact. Then we might say that fundamental ontology seeks a catalog of the fundamental things. When the fundamental ontologist says that the lectern is not 'ultimately real', all he means is that the various facts concerning the table—including the fact that it exists—ultimately obtain in virtue of facts about (say) the physical particles in its vicinity, facts that do not contain the table itself as a constituent.[2]

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So far I have made two points, both preliminary: that we are often tempted to invoke the idioms of metaphysical dependence, which suggests that we often take ourselves to understand them; and that if we do understand them, we are in a position to frame a number of theses and analyses that appear to be worth discussing. Together these considerations supply us with some

[2] I discuss this conception of the project of fundamental ontology further in 'Numbers and Reality' (Rosen, MS). It is to be distinguished from another structurally similar approach, according to which the fundamental facts are the facts that do not admit of reduction or analysis, and the fundamental things are the constituents of facts that are fundamental in this sense. The two approaches will yield different verdicts if there are facts that are grounded in further facts, but which do not admit of analysis or reduction. This possibility is broached in Section 13 below.

reason to believe, and some reason to hope, that the idioms of metaphysical dependence—the grounding idiom, the 'in virtue of' idiom—are clear enough for serious philosophical purposes.

3. DOUBTS ABOUT THE IDIOMS OF DEPENDENCE

These considerations shift the burden: if the idioms of dependence are in fact unclear or otherwise unsuitable for demanding philosophical purposes, we need some account of what is wrong with them. We should grant immediately that there is no prospect of a reductive account or definition of the grounding idiom: We do not know how to say in more basic terms *what it is* for one fact to obtain in virtue of another. So if we take the notion on board, we will be accepting it as primitive, at least for now. But that is obviously no reason for regarding the idiom as unclear or unintelligible. Many of our best words—the words we deem fully acceptable for rigorous exposition—do not admit of definition, the notion of metaphysical necessity being one pertinent example. We should likewise concede that we have no explicit method for determining whether one fact is grounded in another, and that there are many hard questions about the extension of the grounding relation and the principles governing it that we cannot answer. But again, that is not decisive. We have no established routine for deciding whether some hypothesis represents a genuine metaphysical possibility, and the general principles of modality are matters of great controversy. But that does not mean that we do not understand the modal notions. It simply means that there is much about them that we do not know.

One slightly better reason for regarding the idioms of dependence with suspicion is the thought that while these idioms cannot quite be defined in straightforward modal terms, the idioms are always dispensable in practice in favor of the idioms of modal metaphysics—entailment, supervenience, the apparatus of possible worlds, and so on—notions for which we have elaborate for theories, and which are in any case more familiar. And yet it seems to me that this is not true at all. Consider again the debate over legal positivism. One side says that the legal facts are wholly grounded in the social facts; the other says that moral facts play a role in making the law to be as it is. Now try to frame this debate as a debate about a supervenience thesis. The antipositivist says that the legal facts supervene on the moral and the social facts taken together; but of course the positivist will agree. The positivist says that the legal facts supervene on the social facts alone—that possible words cannot differ in legal respects without differing in social respects. But the antipositivist need not deny this. For he may think that whenever two worlds are alike in social respects—whenever they involve the same actions, habits and responses of human beings—they must also agree in moral respects, *since the moral facts*

themselves supervene on the social facts broadly conceived. But in that case the parties will accept the same supervenience claims. And yet they differ on an important issue, viz., whether the moral facts play a role in making the law to be as it is.

Perhaps the best reason for resisting the grounding idiom is the suspicion that despite its superficial intelligibility, the notion is ultimately confused or incoherent. To say that the notion is confused is to say that there are several distinct relations of grounding or dependence in the vicinity, and that uncritical invocation of 'the' grounding idiom conflates them. To say that the notion is incoherent is to say that every effort to set out the principles that govern it ultimately leads to absurdity or incoherence. This was the burden of Quine's critique of the modal idiom as he understood it, and we cannot rule out the possibility that something similar might happen here.

We should bear these possibilities in mind as we proceed, but it is impossible to say in advance whether the idioms we have been discussing really are problematic in these ways. I begin with the working hypothesis that there is a single salient form of metaphysical dependence to which the idioms we have been invoking all refer. The plan is to begin to lay out the principles that govern this relation and its interaction with other important philosophical notions. If the notion is confused or incoherent, we should get some inkling of this as we proceed. On the other hand, if all goes smoothly, we will have neutralized the main grounds for resistance, in which case there can be no principled objection to admitting the notion as intelligible, to be used in raising and answering philosophical questions insofar as this proves fruitful.

4. ONTOLOGICAL BACKGROUND AND NOTATION

The grounding relation is a relation among facts. We may say that A is F in virtue of B's being G, but this is shorthand for the claim that the fact that A is F obtains in virtue of (is grounded in) the fact that B is G.

I shall suppose that facts are structured entities built up from worldly items—objects, relations, connectives, quantifiers, etc.—in roughly the sense in which sentences are built up from words. For my purposes, facts might be identified with true Russellian propositions (King 2007).[3] Facts are individuated

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[3] Nothing in what follows depends on thinking of the fact that p as an item distinct from the proposition that p, which somehow makes that proposition true. My discussion is therefore silent on the question whether every true proposition has a truth-maker. I note, however, that the intuitive notion of a truth-maker presupposes the grounding idiom that is our focus. In this intuitive sense, x is a truth-maker for p iff p is true in virtue of x's existence, i.e., in virtue of the fact that x exists. Some writers replace this formulation with a modal surrogate, holding that the truth-maker for p is an item whose existence entails the truth of p. But this

by their constituents and the manner of their composition. This yields a very fine-grained notion. If p and q are distinct propositions, then the fact that $p \vee \sim p$ is distinct from the fact that $q \vee \sim q$. And this is as it should be. The fact that $p \vee \sim p$ might obtain in virtue of the fact that p. But p cannot possibly ground the fact that $q \vee \sim q$ except in special cases.

I write [p] for the *fact that p*. When the enclosed sentence has internal syntactic structure, I shall assume that we are talking about a fact with constituents corresponding to the relevant symbols. Thus [Fa] will be a fact containing the property F and the object a as constituents.[4]

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I shall write $[p] \leftarrow [q]$ for: *the fact that p is grounded in the fact that q*. Since it will turn out that a given fact may be grounded in several facts taken collectively, the grounding relation is officially plural on the right. The general form of a grounding claim is thus

$$[p] \leftarrow \Gamma$$

where Γ is a non-empty, possibly infinite collection of facts. When [q] is one of several facts that together ground [p], we can say that [p] obtains *in part in virtue of* [q]. In general:

$$[p] \mid\!\leftarrow \Delta =_{df} \text{for some } \Gamma, [p] \leftarrow \Gamma \text{ and } \Delta \subseteq \Gamma.$$

5. STRUCTURAL PRINCIPLES

It seems clear that the binary part of the grounding relation is asymmetric and hence irreflexive. Since the relation is plural on the right, we should accept general versions of these claims:

Strong asymmetry: If $[p] \leftarrow [q], \Gamma$ then not: $[q] \leftarrow [p], \Delta$

Strong irreflexivity: not: $[p] \leftarrow [p], \Gamma$.

The case for strong irreflexivity is clear enough. Just as no fact can make itself obtain, no fact can play a role along with other facts in making itself

threatens to collapse what appear to be real distinctions. If the truths of universal morality have truth-makers, they are distinct from the items that ground the truths of pure mathematics. But on the simple entailment account, everything is a truth-maker for every necessary truth. For a non-classical account of entailment and truth-making that avoids these difficulties, see Restall (1996).

[4] For expository purposes I shall assume that facts and propositions are structured like sentences in the language of the predicate calculus and its familiar extensions. This is entirely provisional. Nothing should be taken to hang on this assumption. I do not assume that every predicate corresponds to a property, or that every true sentence corresponds to a fact whose structure mirrors the syntactic structure of the sentence. The examples that follow must therefore be understood in a conditional spirit: *if there are facts of such and such a form, then . . .*

obtain. Strong asymmetry (which entails strong irreflexivity) is less evident. The thought is that when we cite grounds for [p], we cite facts that are strictly prior to [p] in a certain explanatory order. If [q] plays a role in making it the case that p, then [q] must be 'more fundamental' than [p], in which case [p] cannot play a role in making it the case that q. These principles are more perspicuous when formulated in terms of the notion of partial grounding:

Strong asymmetry: If [p] $\shortmid\!\leftarrow$ [q] then not: [q] $\shortmid\!\leftarrow$ [p]

Strong irreflexivity: Not: [p] $\shortmid\!\leftarrow$ [p].

If [q] is part of what makes it the case that p, then [p] contributes nothing to making it the case that [q]; and [p] plays no role whatsoever in making it the case that p.

The grounding relation is not obviously transitive, but I shall assume transitivity in a strong form.

Strong transitivity: if [p] $\leftarrow$ [q], Γ and [q] $\leftarrow \Delta$ then [p] $\leftarrow$ [q], Γ, Δ.

If the most fundamental relation in the vicinity is not transitive, then $\leftarrow$ picks out its transitive closure.

The relation is presumably not connected. Barring some enormous surprise in metaphysics, it seems clear that the fact that 5 is prime neither grounds nor is grounded by the fact that wolverines are fierce. So partial grounding is at best a partial order on the domain of facts.

We should not assume that the relation is well founded. That is a substantive question. It may be natural to suppose that every fact ultimately depends on an array of basic facts, which in turn depend on nothing. But it might turn out, for all we know, that the facts about atoms are grounded in facts about quarks and electrons, which are in turn grounded in facts about 'hyperquarks' and 'hyperelectrons', and so on ad infinitum. So we should leave it open that there might be an infinite chain of facts [p] $\leftarrow$ [q] $\leftarrow$ [r] $\leftarrow \ldots$

We must emphatically reject a principle that is plausible in other formally analogous contexts. The grounding relation resembles a relation of consequence or entailment. And in most contexts we suppose that if Γ entails p, then so does Γ together with q—where q can be any sentence or proposition. The analogous principle of *monotonicity* does not hold in the present context. Intuitively, if p is grounded in Γ, then *every fact in* Γ plays some role in making it the case that p. Holding this fixed, monotonicity would entail that each fact plays a role in grounding every fact. And that is just not so.

The failure of monotonicity is a general feature of explanatory relations. Suppose that C caused E, and hence that E occurred in part because C occurred. It does not follow that E occurred in part because C and X occurred, where

X is an arbitrary event. This would entail that X played some role in bringing E about, which need not be the case. Since the grounding relation is an explanatory relation—to specify the grounds for [p] is to say why [p] obtains, on one version of this question—we should expect monotonicity to fail in the present context.

6. INTERACTIONS WITH LOGIC: EASY CASES

Some of the clearest examples of grounding involve facts that stand in simple logical relations. Thus it seems quite clear that if there are disjunctive facts, then a disjunctive fact is grounded in its true disjuncts. If Fred is in New York, then Fred is either in New York or Rome. Moreover, the fact that Fred is in New York or Rome obtains *in virtue of the fact that Fred is in New York*. In general:

FN:5 ($\vee$): If p is true, then $[p \vee q] \leftarrow [p]$.[5]

If Feldman is both a doctor and a lawyer, then the fact that he is either a doctor or a lawyer obtains in virtue of each of its disjuncts. This is a harmless form of metaphysical overdetermination.

For similar reasons, it seems clear that existential facts are grounded in their instances. If Jones voted for the anarchists, then someone voted for the anarchists. And if we ask *in virtue of what is it the case that someone voted for the anarchists*?, one good answer will be: *someone voted for them in virtue of the fact that Jones voted for them*. In general:

FN:6 ($\exists$): If $\varphi(a)$ is true, then $[\exists x\, \varphi x] \leftarrow [\varphi a]$.[6]

If an existential fact has several instances, it is fully grounded in each. This is another form of harmless overdetermination.

Conjunctive truths are made true by their conjuncts, not individually, but collectively. In general, neither [p] nor [q] has what it takes to make it the case that $p \wedge q$. But just as several knights together can surround the castle, several facts together can ground a single fact:

($\wedge$): If $p \wedge q$ is true, then $[p \wedge q] \leftarrow [p], [q]$.

[5] This is compatible with there being cases in which a disjunctive fact obtains even though neither disjunct is true. To exclude this, we could accept a stronger principle:

($\vee+$) If $p \vee q$ is true, then either $[p \vee q] \leftarrow [p]$ or $[p \vee q] \leftarrow [q]$.

[6] Again, we could accept a stronger principle:

($\exists+$) If $\exists x\, \varphi x$ is true, then for some y, $[\exists x\, \varphi x] \leftarrow [\varphi(y)]$.

7. THE ENTAILMENT PRINCIPLE

These examples illustrate a principle that has been implicit in our discussion all along. If [p] is grounded in [q], then q entails p. Stated more generally:

FN:7 Entailment: If $[p] \leftarrow \Gamma$ then $\Box(\wedge\Gamma \supset p)$.[7]

The facts that ground [p] together ensure as a matter of metaphysical necessity that [p] obtains. This is one respect in which the grounding relation differs from causal and other merely nomic forms of determination. On the present view, there is a difference between the materialist who holds that the facts about phenomenal consciousness are grounded in, and hence necessitated by, the neurophysiological facts that underlie them, and the dualist for whom the neural facts merely cause
FN:8 or generate conscious states according to contingent causal laws.[8]

8. THE GROUNDING OF UNIVERSAL FACTS

As Russell noted, universal truths are not entailed by the conjunction of their instances (Russell 1918). Even when a, b, . . . amounts to a complete inventory of the universe, the premises *Fa, Fb*, . . . do not entail $\forall x Fx$, since the premises taken together are consistent with their being some item distinct from a, b, . . . that is not F. Given the Entailment Principle, we cannot say that a universal truth is
FN:9 grounded in its instances taken together.[9]

[7] Γ is a list of facts and is therefore unsuitable to serve as the antecedent of a conditional. $\wedge\Gamma$ is the conjunction of the propositions that correspond to the facts in Γ.

[8] Should we distinguish the materialist for whom the phenomenal facts are grounded in the neural facts together with contingent psychophysical laws from the dualist for whom the phenomenal facts are merely *caused* by the neural facts according to psychophysical laws? We should. The difference will be clearest if the dualist allows that the relevant causal laws may be indeterministic, for in that case the underlying facts will not necessitate the phenomenal facts. But even if the laws are deterministic there is room for a distinction. In a deterministic physical universe, the initial state of the universe and the laws together necessitate every subsequent state. But we would not say that the current state of the universe obtains *in virtue of* the initial state together with the laws, at least not in the sense of that notion that I wish to isolate. In that sense, the grounding relation is a *synchronic* relation. When [p] is a fact wholly about how things are at any given time, then any fact that grounds [p] must also concern that time. Now this observation by itself does not preclude assimilating *simultaneous deterministic causation* (of the sort that might exist in the mind–body case) to grounding. But it strikes me as much more natural to keep causal relations on one side—as external relations among wholly distinct states of affairs—and grounding relations on the other. If that is right, then it is one thing to say that physical states synchronically *cause* phenomenal states according to deterministic laws, and another to say that the physical states and the laws together suffice to *ground* the phenomenal facts.

[9] We could evade this argument if we could assume that the inventory of objects is fixed as a matter of metaphysical necessity, for then the premises *Fa, Fb*, . . . would entail $\forall x Fx$. On this gambit, see Williamson (1998) and Linsky and Zalta (1994).

Must we then say that every universal fact is a brute fact? Not at all. In special cases it will often be clear that a given universal fact is grounded in more basic universal facts. Thus if all Fs are G, it follows that all Fs are G or H. And in such cases we should say: All Fs are G or H in virtue of the fact that all Fs are G. The interesting question is whether universal facts might be grounded in facts that are not themselves universal. Let me mention some possibilities.

(a) Universal facts grounded in essences

Every triangle has three angles. Why? Because it lies in the *nature* of a triangle to have three angles. *Part of what it is* to be a triangle is to have three angles. That is why, as a matter of fact, every triangle has three angles. Indeed, that is why as a matter of *necessity* every triangle has three angles.

Let us follow Kit Fine in writing $\Box_x p$ for: *it lies in x's nature that p*, or (as Fine sometimes puts it) *p obtains in virtue of what it is to be x*, or *in virtue of x's identity* (Fine 1994, 1995).[10] In the example we might have:

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$$\Box_{\text{triangularity}}\ \forall x(x \text{ is a triangle} \supset x \text{ has three angles}).$$

The proposal is that this claim about the nature of a property might ground a simple universal generalization, according to the following principle:

Essential grounding: If $\Box_x p$ then $[p] \leftarrow [\Box_x p]$.

When p is a universal generalization, this gives us one way in which a universal generalization can be grounded in a truth that is not itself a universal generalization.[11]

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(b) Universal facts grounded in strong laws

Now consider a rather different case. Why is it that, as a matter of fact, any two bodies attract one another with a force inversely proportional to their square distance and proportional to their masses? It is natural to say that this mere

[10] The 'in virtue of' in these informal glosses of Fine's key notion is not exactly the relation we have been discussing under that rubric. Our relation is a relation among facts or truths, whereas Fine's relation, if it is a relation at all, is a relation between a given truth and the *items* whose natures ground that truth. It is an open question whether Fine's primitive $\Box_x p$ might be defined in terms of our grounding relation together with other materials. The most straightforward approach would be to identify some class of propositions involving x—x's essence—and then to define $\Box_x p$ as follows:

For some subset Γ of x's essence, $p \leftarrow \Gamma$.

But this is problematic for a number of reasons. In particular, it entails that no basic proposition can be an element of x's essence. And it is unclear whether that is a welcome consequence. I hope to expand on these issues elsewhere.

[11] We should presumably also accept a stronger principle:

Strong essential grounding: If $\Box_x p$ then $\Box p \leftarrow \Box_x p$.

generalization corresponding to Newton's law of gravitation holds *because it is a law of nature that bodies attract one another in this way*. This is controversial as a matter of philosophy, of course. The so-called Humean view would reverse the explanatory order, insisting that the nomic fact obtains in part because every body happens to attract every other body in a certain way (Lewis 1973*b*). But proponents of the anti-Humean view will say that the nomic facts (the laws of nature) explain the mere generalizations that correspond to them (Armstrong 1983). Moreover, as the anti-Humean understands these matters, this is not mere causal explanation or anything of the sort. P's lawhood *ensures* p's truth as a matter of metaphysical necessity. In our idiom, we might understand the anti-Humean's fundamental claim as a claim about that in virtue of which certain universal truths obtain:

Natural Necessity: If it is a strong law of nature that p, then [p] $\leftarrow$ [It is a strong law that p].

Where p is a universal generalization, this gives another way in which a universal fact may be grounded in a fact that is not itself universal.[12]

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(c) Accidental regularity

In the cases we have discussed so far, a universal fact is grounded in a broadly modal fact—a fact about laws or essences. In these cases, the generalization holds *because it must*. A generalization that is not so grounded is (in one good sense) an accidental regularity. We have seen that some accidental regularities are grounded in others. Can we say anything general about how such generalizations might be grounded?

As noted above, a complete inventory of instances Fa, Fb, . . . fails to entail, and so fails to ground the corresponding generalization. But even when [$\forall$xFx] is a thoroughly accidental regularity, it is entailed by its instances together with what D. M. Armstrong calls a *totality* fact: the fact that a, b, c, etc. are all the things there are (Armstrong 1997). The totality fact is itself a universal fact:

$[\forall x(x = a \vee x = b \vee \ldots)]$.

But it is a universal fact of a special kind. And so we might say that when [$\forall$xFx] is an ordinary accidental regularity, it always grounded at least in the following way:

$[\forall xFx] \leftarrow [Fa], [Fb], \ldots [\forall x(x = a \vee x = b \vee \ldots)]$.

[12] This pattern of explanation may be extended to regularities that are not themselves laws, but which are the consequences of laws. For example, it might be a law that all Fs are G, and a law that all As are B; and yet it might not be a law that everything that is either F or A is G or B. Nonetheless, the universal regularity—$\forall x(Fx \vee Ax) \supset (Gx \vee Bx)$—might be grounded in the two laws taken together.

On this approach, there will be at most one ungrounded universal generalization, namely, the totality fact itself.[13]

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9. THE GROUNDING OF MODAL TRUTHS

The truths concerning metaphysical possibility and necessity are either analyzable or they are not. If they are—that is, if there is a way of saying in more basic terms *what it is* for a truth to be necessary—then the account will entail an account of the grounds of necessity. Thus, if Lewis is right about the nature of modality, then any fact of the form [□p] reduces to a fact of the form [For all worlds w, p/w], where p/w is the result of restricting the quantifiers in p to parts of w (Lewis 1986b). On such a view it will follow, given a principle to be annunciated shortly, that [□p] obtains in virtue of the fact that every world is a p-world. Alternatively, if a conjecture of Kit Fine's is correct, the modal facts may be analyzed as follows:

[□p] reduces to [$\exists X \Box_X p$].

In words: For it to be necessary that p just is for there to be some things, X, such that p holds in virtue of the natures of the Xs. On such a view it will follow that the facts about metaphysical necessity obtain in virtue of certain existentially general facts about the natures of things, which in turn hold, given our principle governing existential generalizations, in virtue of their instances.

Now many writers are skeptical about the prospects for a reductive analysis of modality. Fine himself worries that his essentialist account will omit what metaphysical necessity has in common with other forms of necessity—specifically normative necessity and nomic necessity—which cannot be analyzed in this way (Fine 2002). He thus entertains the possibility that metaphysical necessity might be analytically basic. We may note, however, that even if Fine is right about this, the facts of metaphysical modality might nonetheless be systematically *grounded* in existentially general facts about essences according to the following principle:

If □p is true, then [□p] $\leftarrow$ [$\exists X \Box_X p$].

Just as a Moorean may regard the moral facts as unanalyzable while insisting that each moral fact is grounded in facts about (say) the distribution of happiness, so Fine might regard the irreducible facts of metaphysical modality as systematically grounded in the essences of things.

[13] If the existence of one thing can be grounded in the existence of others, then the totality fact need not be basic. The basic fact in the vicinity might simply itemize the *ontologically fundamental* items and assert the completeness of the inventory.

10. THE GROUNDING-REDUCTION LINK

The discussion in the previous section assumes a principle that we must now make explicit. The principle connects what I have called 'reduction' or 'analysis' with the grounding idiom. We may put it roughly as follows.

If p reduces to q and p is true, then [p] $\leftarrow$ [q].

But now we must say something more about reduction.

As I understand the notion, reduction is a metaphysical matter. To say that p reduces to q is not to say that p and q are synonymous, or that q gives the meaning of p. It is give an account of what it is for p to obtain. When we ask what it is for a substance to be a metal or for a curve to be continuous or for a person to be responsible for an action, we are not asking questions about what ordinary speakers or even experts have in mind. We are asking questions about the natures of the properties and relations in question.

These examples suggest a tight connection between reduction and what is sometimes called *real definition*. The objects of real definition are *items*—typically properties and relations, but possibly also items in other categories. When a philosopher asks the old Socratic questions—What is knowledge? What is justice?—she is asking for definitions, not of words, but of things. This suggests that the canonical form of a real definition should be this:

$X =_{df} \ldots$

But without significant distortion we may think of reduction and real definition as a relation among *propositions* that contain the target items as constituents. Instead of asking, 'What is knowledge?', we can ask: 'What is it for a person to know that p?' And the answer, if there is one, will take the following form: For all x, p, for x to know that p just is for it to be the case that φ(x,p). In general, real definitions of properties and relations, which are normally expressed by verbal formulae of the following sort:

To be F just is to be φ.

might just as well be expressed as follows:

For all x, for it to be the case that Fx just is for it to be the case that φx.

On this approach, reduction or analysis is a relation among propositions, and real definitions of items are given by general schemata for such reductions.

Some notation may help. Let us write $\langle$p$\rangle$ as a name for the structured Russellian proposition that p. As above, where *p* has internal structure—where *p*

is *Rab*, for example—we suppose that the name, ⟨Rab⟩, picks out the proposition with the corresponding structure (if there is one). Let us write

⟨p⟩ ⇐ ⟨q⟩

for *p reduces to q*, or more long-windedly: *for it to be the case that p just is for it to be the case that q*, or *p's being the case consists in q's being the case*. The real definition of a relation R then takes the following canonical form:

For all x, y, . . . ⟨Rxy . . . ⟩ ⇐ ⟨φxy . . . ⟩

where φ is a complex that does not contain R as a constituent. Items in other categories admit of analogous definitions. To define a unary function f is to assert a claim of the form:

For all x, y ⟨f(x) = y⟩ ⇐ ⟨φ(x,y)⟩.

And one way to define an object a is to assert a claim of the form:

For all x, ⟨x = a⟩ ⇐ ⟨x = g(b)⟩.

For example, someone might propose that to be the number 2 just is to be the successor of 1. In our notation:

For all x, ⟨x = 2⟩ ⇐ ⟨x = s(1)⟩.

In some special cases we may want to say that one state of affairs reduces to another even though no constituent of the reduced state of affairs admits of this sort of explicit definition. Thus a neo-Fregean philosopher of mathematics who accepts this notion of reduction may wish to claim that propositions of the form

⟨the number of Fs = the number of Gs⟩

reduce to corresponding propositions of the form

⟨there is a one-one function *f* from F to G⟩.

Moreover, they may wish to claim this without insisting that there exists an explicit definition of 'number of' that would permit the reduction of arbitrary propositions in which this function figures (Wright 1983; Hale and Wright 2003; Rosen and Yablo, ms). One virtue of the general policy of conceiving of reduction as a relation among propositions is that it leaves room for semireductionist proposals of this kind.

The principle connecting grounding and reduction may now be formulated as follows:

Grounding-Reduction Link: If ⟨p⟩ is true and ⟨p⟩ ⇐ ⟨q⟩, then [p] ← [q].

In words: If p's being the case consists in q's being the case, then p is true in virtue of the fact that q. The prima facie case for the Link comes from examples.

To be a square just is to be an equilateral rectangle, let us suppose. This means that if ABCD is a square, then it is a square in virtue of being an equilateral rectangle. To be an acid just is to be a proton donor. So HCl is an acid in virtue of the fact that HCl is a proton donor. Suppose Lewis is right; suppose that for a proposition to be necessary just is for it to hold in all possible worlds. Then it is a necessary truth that whatever is green is green, and if we ask what *makes* this proposition necessary, the answer will be: It is necessary in virtue of the fact that it is true in every world.

These instances of the Grounding-Reduction Link have a certain ring of plausibility. We do think that correct analyses support explanatory claims, and it is natural to suppose (having come this far) that these explanations point to metaphysical grounds of the sort we have been discussing. But the Link presents us with a real puzzle. After all, if our definition of square is correct, then surely the fact that *ABCD* is a square and the fact that *ABCD* is an equilateral rectangle are not different facts: they are one and the same. But then the Grounding-Reduction Link must be mistaken, since every instance of it will amount to a violation of irreflexivity.

If we wish to retain the Link, we must insist that reduction is a relation between distinct propositions. There is some evidence that this is in fact how we conceive the matter. Thus it sounds right to say that Fred's being a bachelor consists in (reduces to) his being an unmarried male, but slightly off to say that Fred's being an unmarried male consists in (or reduces to) his being a bachelor. This asymmetry corresponds to an explanatory asymmetry. Fred is a bachelor because (or in virtue of the fact that) he is an unmarried man, but not vice versa. On the assumption that the explanatory relation in question is a relation between facts or true propositions, this asymmetry entails that the reduced proposition and the proposition to which it reduces must be distinct.

The trouble comes from our commitment to the thesis that facts and propositions are individuated by their worldly constituents and the manner of their combination. For surely the *property* of being a bachelor just is the *property* of being an unmarried male (if the analysis is correct). And this means that any proposition or fact in which the former figures just is the corresponding proposition or fact in which the latter figures. But if the operation of replacing an item in a fact with its real definition yields the same fact again, this operation cannot possibly yield a fact in virtue of which the original fact obtains. And this means that the Grounding-Reduction Link must be mistaken.

We can resist this line of thought by insisting that the operation of replacing a worldly item in a fact with its real definition never yields the same fact again. It yields a new fact that 'unpacks' or 'analyzes' the original. To see that this is plausible, consider an example involving the real definition of an individual.

Suppose for the sake of argument that to be the number two just is to be the successor of 1. In our notation,

For all x, $\langle x = 2\rangle \Leftarrow \langle x = s(1)\rangle$.

One might accept this while rejecting the exotic view that the number 2 somehow contains the number 1 as a part or constituent. Simply from the fact that 1 figures in the *definition* of 2, it does not follow that 1 is a part of 2. But now propositions (and facts) are individuated by their constituents. So we can readily accept the definition while insisting that in general $\langle \ldots 2 \ldots\rangle$ and $\langle \ldots s(1) \ldots\rangle$ are distinct propositions. The former contains 2 as a constituent, but need not contain the successor function or the number 1; the latter contains *successor* and the number 1, but need not contain the number 2.

Now turn to an example involving properties. We have supposed that to be a square just is to be an equilateral rectangle, i.e.,

$\Box\forall x\ \langle \text{Square } x\rangle \Leftarrow \langle \text{Equilateral } x \wedge \text{Rectangle } x\rangle$.

But it does not follow from this that the property of being square contains the properties that figure in its definition as constituents. To be sure, it is somewhat natural to think of a conjunctive property as some sort of construction from its conjuncts, for in these cases we may think: Whenever the conjunctive property is present, each of its conjuncts is also present, and this would be explicable if the conjunctive property were some sort of aggregate of its conjuncts. But in general, the thesis that a property is composed of the items that figure in its definition is not so plausible. Suppose that for a thing to be grue just is for it to be green or blue. Should we suppose that wherever grue is present, green and blue are also present? Obviously not, since this would entail that each is present whenever the other is. Instead we should say that while green and blue may both figure in the definition of grue, the property of being grue does not contain either of these properties as a constituent. Rather grue stands to green and to blue as the value of a function stands to its arguments. And as Frege stressed, this relation is not one of part to whole (Frege 1904). We are therefore led to say that while the proposition that a is grue reduces to the proposition that a is green or blue, these propositions are nonetheless distinct. The former contains *grue* but not *green* as a bona fide constituent, whereas the latter contains *green* but not *grue*.[14]

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[14] Note that we do not reject the straightforward identities:

The property of being grue = the property of being green or blue

The property of being square = the property of being an equilateral rectangle.

And this means that there is a sense in which we must accept the following identity

$\langle \ldots$ the property of being grue $\ldots\rangle = \langle \ldots$ the property of being green or blue $\ldots\rangle$.

But the sense in which this identity holds is one in which the proposition designated on the right does not contain green or blue as constituents. Language may mislead us here. Consider the noun phrase:

If we go this route, we can retain the Grounding-Reduction Link. When we reduce ⟨p⟩ to ⟨q⟩, we reduce a relative simple proposition to a distinct, relatively complex proposition. There is then no bar to supposing that the truth of the complex proposition *grounds* or *explains* the truth of the relatively simple proposition of which it is the reduction.

11. DETERMINABLES AND DETERMINATES, GENERA AND SPECIES

It may be useful to bring this apparatus to bear on another topic. Consider a bright blue ball. The fact that the ball is blue is presumably not a brute fact. It might be grounded in microphysical facts about the ball's surface, or in facts about its dispositions to reflect light. But let us suppress the scientific subtleties and pretend that the colors are simple properties with no deep nature. Still, the fact that the ball is *blue* is not a brute fact. Suppose that our ball is a uniform shade of blue—let it be cerulean. Then it seems quite natural to say that the ball is blue *in virtue of being cerulean*. Another ball might be blue *for a different reason:* it might be blue in virtue of being cobalt blue. If we ask, What is it about these balls that makes them blue?, we get different answers in the two cases. And this suggests a general principle.

Determinable-Determinate Link: If G is a determinate of the determinable F and a is G, then [Fa] ← [Ga].[15]

FN:15

Now contrast this case with a superficially similar case. Every square is a rectangle but not vice versa. Square is thus a more *specific* property than

the proposition that 2 is prime. Since 2 is the successor of 1, we could pick out the same proposition by means of the noun phrase: *the proposition that the successor of 1 is prime*. But this would be misleading in many contexts, since the same noun phrase would more naturally be used to pick out a different proposition, viz., ⟨prime s(1)⟩. The same thing can happen with predicative expressions and with noun phrases of the form *the property of being φ*. Since grue is the property of being either green or blue, the proposition ⟨grue a⟩ might be picked out by the noun phrase: *the proposition that a has the property of being either green or blue*. But this would be misleading, since the same phrase might also pick out the proposition ⟨blue a ∨ green a⟩, which contains green and blue as constituents.

In general, when a functional term *f(a)* occurs in the name of a proposition, ⟨. . . *f(a)* . . .⟩ the expression as a whole will naturally be taken to pick out a complex that contains f and a as constituents. That is the convention with which he has been operating in this paper. But it may also denote a complex that contains only the *value* of f on a in the relevant position. English expressions like *the property of being green or blue* are functional expressions in this sense, and this means that whenever such a term occurs in the name of a proposition, the expression as a whole may designate a proposition containing the relevant *arguments* for the function in question (green and blue) or a proposition containing only the value of that function for these arguments (grue). The use of a simple name for the property in question—*grue*, for example—tends to block the former reading and is therefore useful.

[15] We might prefer a stronger claim: If F is a determinable and a is F, the there is some determinate G of F such that [Fa] ← [Ga]. For speculative doubts about this, see Rosen and Smith (2004).

rectangle, just as cerulean is more specific than blue. Indeed, there is a sense in which square, like cerulean, is a maximally specific property in its family: Just as any two things that are cerulean must be *exactly* the same color, so any two things that are square must be exactly the same shape. The relations between the more determinate property and the less determinate one are thus rather similar in the two cases.

And yet there is a difference. Square is not a determinate of rectangle. It is rather a species of the genus, in one traditional sense of these terms. In this traditional sense, a species is defined as the conjunction of genus and differentia. In our notation:

For all x, $\langle \text{Species x} \rangle \Leftarrow \langle \text{Genus x} \wedge \text{Differentia x} \rangle$.

To be a square (species) just is to be an equilateral (differentia) rectangle (genus). The determinate–determinable relation is rather different, as is well known. Cerulean cannot plausibly be defined as a conjunction of blue and some other property φx.

For all x, $\langle \text{Cerulean x} \rangle \Leftarrow \langle \text{Blue x} \wedge \varphi\text{x} \rangle$.

What could possibly complete the formula?

Does this difference make a difference? Perhaps. As noted, a ball may be blue in virtue of being cerulean. By contrast, it seems quite wrong to say that *ABCD* is a rectangle in virtue of being a square. If we ask what it is about the figure *ABCD* that makes it a rectangle, the answer must be something like this: the thing is a rectangle because it is a right quadrilateral. The fact that its sides are equal—the fact responsible for its being a square—simply *plays no role* making the figure rectangular. The striking fact, then, is that despite the similarities between the determinable–determinate relation on the one hand and the genus-species relation on the other, there is this difference: the determinate grounds the determinable, but the species does not ground the genus.

Our principles yield a straightforward explanation of this fact. Suppose that S is a species of the genus G, and that a is S (and therefore G). Now suppose for reductio that a is G in virtue of being S.

(1) $[\text{Ga}] \leftarrow [\text{Sa}]$.

Since S is a species of G, we know that for some differentia D,

(2) $\langle \text{Sa} \rangle \Leftarrow \langle \text{Ga} \wedge \text{Da} \rangle$.

Given the Grounding-Reduction Link, this entails:

(3) $[\text{Sa}] \leftarrow [\text{Ga} \wedge \text{Da}]$.

Our principle governing conjunctions, ($\wedge$), then assures us that

(4) $[\text{Ga} \wedge \text{Da}] \leftarrow [\text{Ga}], [\text{Da}]$.

And so by two applications of transitivity, it follows that

(5) [Ga] ← [Ga], [Da].

But this is a violation of strong irreflexivity.

The intuitive point is straightforward. Since a species in the old-fashioned sense is defined by genus and differentia, a thing must belong to the species in part because it belongs to the genus. But then it cannot also belong to the genus in virtue of belonging to the species. The explanatory arrows in this area all point in the same direction. By contrast, nothing prevents a thing from possessing a determinable property in virtue of possessing some determinate thereof.

12. EXPLAINING THE DETERMINABLE–DETERMINATE LINK

Our framework thus provides an easy account of why an object that belongs to a given species in virtue of belonging to the corresponding genus, and not vice versa. Can we also explain why it is that when a thing possesses a determinate property like cerulean, it possess the corresponding determinable (blue, colored) in virtue of possessing that determinate?

The most straightforward approach would begin by reducing determinable properties like blue to disjunctions of their determinates. In general, we might say:

> Where F is a determinable property with determinates G_1, G_2, . . ., for all x, $\langle Fx \rangle \Leftarrow \langle G_1x \vee G_2x \vee \ldots \rangle$.

We could then derive the Determinate–Determinable Link via the Grounding-Reduction Link and the principle governing disjunctions, ($\vee$).[16]

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I can think of no decisive reason to reject this 'disjunctivist' approach, but a suggestive line of thought weighs against it. Suppose that Smith is familiar with many shades of blue but has never seen cerulean and has no conception of it. At this point Smith has no way of thinking about cerulean. We can even imagine that he is constitutionally incapable of thinking of it, perhaps because he lacks the neurons that would have to fire in order for him to perceive or imagine this particular shade. Would this deficit prevent him from knowing *what it is* for a thing to be blue? Needless to say, it would not prevent him from being competent with the word 'blue', or from knowing a great deal about the color blue. But would it prevent him from knowing everything there is to know about the *essence* of the color? Recall that we are operating under the pretense that

[16] The claim is not that any old disjunction of properties suffices to define a determinable with the disjuncts as determinates. It is simply that when F is a determinable, whatever that comes to, it reduces ipso facto to the disjunction of its determinates.

colors are sui generis properties, and hence that one might know their natures without knowing anything about the physics of light or surfaces. Relative to this pretense, it is natural to suppose that you and I know everything there is to know about the natures of blue, or that we could know this simply on the basis of reflection and simple experiments.[17] But if we know this, so does Smith, who does not and perhaps cannot think of cerulean. And if he knows the nature of the color blue, the exhaustive disjunction that we have been discussing cannot be a correct account of its nature.[18]

This argument exploits uncertain intuitions about what it takes to *know* the nature of a thing in order to rule out a proposed account of the nature of that thing. This strategy is obviously somewhat perilous, and so we should not place to much weight on these considerations. It is worth noting, however, that these worries do not undermine the most salient alternative proposal.

This salient alternative appeals to higher-order properties. The various determinate shades of blue all have something in common. They are all *blues*—as in, 'Some blues are more saturated than others'—or *shades-of-blue*. Similarly, the determinate masses, shapes, positions, pitches and so on are all unified collections of properties. Each mass property, e.g., the property of weighing exactly 2kg, is a *mass*. In light of this we may conjecture that each determinable property F of ordinary individuals is associated with a second-order property of properties: the property of *being an F-determinate*. On the alternative account, the determinable F is then defined as follows:

For all x, $\langle Fx \rangle \Leftarrow \langle \exists G \;\; G \text{ is an F-determinate} \wedge Gx \rangle$.[19]

To be blue is to instantiate some *shade-of-blue*. To have mass is to have *a* mass, i.e., *some* mass or other, e.g. 2kg. We may then derive instances of the Determinable–Determinate Link by means of the Grounding-Reduction Link and the principle governing the grounding of existential truths, (∃).

This 'existentialist' approach is not vulnerable to the epistemic objection we raised against the previous disjunctivist proposal. Anyone who is in a position to know what it is for a thing to be blue should be in a position to think of a given property as a shade-of-blue. So perhaps this account is to be preferred.

However we proceed, we will have a straightforward account of why a thing possesses a determinable property in virtue of possessing some determinate

[17] Cf. Johnston (1992, p. 138): 'The *intrinsic nature* of canary yellow is *fully revealed* by a standard visual experience as of a canary yellow thing (and the same goes, *mutatis mutandis*, for the other colors).'

[18] A less fanciful example: If someone proposes that *to have mass* is to have either m_1 or m_2 or . . . where the m_i*s* are all of the determinate masses, we may object that our incapacity to think about the vast majority of these masses (thanks to our finitude) does not prevent us from knowing what there is to know about the nature of mass.

[19] This is not objectionably circular. The second-order property of being an F-determinate is supposed to be definitionally prior to the first-order property F, and neither it nor its definition involves F as a constituent, orthography notwithstanding.

thereof, and the account will not generalize to the case of genus and species. A genus may be equivalent to the disjunction of its possible species. But it will not be correctly defined by this disjunction. That would invert the definitional order, in which the species is defined by reference to the genus and not vice versa. Likewise, each genus G may be associated with a second-order property, *being a species-of-G*. But it would be a mistake to define the genus by reference to this property, saying that for a thing to be rectangle (say) just is for it to instantiate some property that is a *species-of-rectangularity*. That would be to miss the much better definition in terms of genus and differentia.

13. MOOREAN CONNECTIONS

The discussion in the previous section illustrates an important phenomenon. In many cases, when one fact obtains in virtue of another we can begin to explain why this grounding fact obtains by pointing to one or more constituents of those facts whose natures 'mediate' the connection. This ball is blue in virtue of being cerulean. Why does the latter fact ground the former? Because (a) the ball is cerulean, and (b) as a matter of necessity, whenever a thing is cerulean, it is blue in virtue of being cerulean. And why does (b) hold? Because (c) cerulean is a shade-of-blue and (d) it lies in the nature of the color blue that whenever a thing instantiates a shade-of-blue, it is blue in virtue of instantiating that shade.[20] Anyone who knows these facts should find it totally unsurprising that our ball is blue in virtue of being cerulean.

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In this sort of explanation, particular grounding facts are explained by appeal to ordinary facts (e.g., [the ball is cerulean]) together with general, broadly formal principles of grounding—e.g., for all x, if x is cerulean then [x is blue] $\leftarrow$ [x is cerulean]. These formal principles are then explained by appeal to further facts—e.g., cerulean is a shade-of-blue—together with essential truths about the natures of at least one of the items in question.

We seem to see a similar pattern in other cases. The disjunctive fact [p $\vee$ q] is grounded in [p]. Why? Let's make the explanation as explicit as possible. [p $\vee$ q] is grounded in [p] because

(a) p is true

(b) [p $\vee$ q] is a disjunctive fact with p as one of its disjuncts

(c) In general, if p is true, then [p $\vee$ q] $\leftarrow$ [p].

And why is (c) true? Because:

(d) $\Box_{\vee}$ For all p, q: (if p is true, then [p $\vee$ q] $\leftarrow$ [p]).

[20] This assumes the second account of the nature of blue given above. The 'disjunctivist' would give a different answer at this point.

The last claim is a claim about the nature of disjunction. The general law identified in (c)—that a disjunction is grounded in its true disjuncts—is not a mere regularity or a law of nature. It is an essential truth. Disjunction may be indefinable, in the sense that there may be no account in more basic terms of what it is for $p \vee q$ to be the case. Nonetheless it seems quite plausible that it lies in the nature of disjunction that disjunctive truths should be so grounded. On this view, to know the nature of disjunction is not simply to know the conditions under which a disjunctive proposition is true. It is to know something about what *makes* such propositions true. Anyone who knows the nature of disjunction in this sense should find it totally unmysterious that our original disjunctive fact $[p \vee q]$ is grounded in the truth of its true disjunct, in this case p.

We see a similar pattern when we attempt to explain why some particular conjunctive fact is grounded in its conjuncts, or why some regularity is grounded in a law, or why some claim of metaphysical necessity is grounded in a general claim about essences. This law grounds that regularity because (a) the law holds, and (b) it lies in the nature of (strong) lawhood that when a law holds, the corresponding regularity holds in virtue of that law. The fact that triangles *must* have three angles is grounded in the fact that it lies in the nature of triangles to have three angles. Why? Because (a) triangles are essentially three-angled, and (b) it lies in the nature of *necessity* that if p is an essential truth, then p is a necessary truth in virtue of being an essential truth.

The examples suggest the following two-part conjecture.

FN:21 Formality: Whenever $[A] \leftarrow [B]$, there exist propositional *forms*[21] φ and ψ such that

(i) A is of the form φ; B is of the form ψ; and

(ii) For all propositions p, q: if p is of the form φ and q is of the form ψ and q is true, then $[p] \leftarrow [q]$.

Mediation: Every general grounding principle of the form (ii) is itself grounded in, and hence explained by, an essential fact of the form (iii):

(iii) $\Box_X$ (For all propositions p, q: if p is of the form φ and q is of the form ψ and q is true, then $[p] \leftarrow [q]$)

FN:22 where the X's are constituents of the propositional forms in question.[22]

[21] Propositional forms are properties of propositions, like the property of being a conjunctive proposition. It is convenient to think of them as the result of replacing one or more constituents in a proposition with schematic items of some sort. Thus if we start with a determinate proposition, say $\langle A \vee B \rangle$, we can generate various propositional forms: $\langle \alpha \vee \beta \rangle$, $\langle A \vee \beta \rangle$, and even $\langle \alpha * \beta \rangle$, where $*$ is a schematic connective. If we think in these terms, then we may speak of the constituents of a propositional form as the real, non-schematic items that figure in it. Thus the propositional form $\langle \alpha \wedge \beta \rangle$ would have conjunction as a constituent.

[22] Note that the connection between (ii) and (iii) is an instance of the principle we earlier called *Essential Grounding*: For all p: If $\Box_X p$, then $[p] \leftarrow [\Box_X p]$. In the spirit of the present section, we

Note that this proposal is a proposal about how the facts about grounding are themselves grounded. Every true instance of this sort of pattern will yield a claim involving multiple occurrences of $\leftarrow$, e.g.,

$([A \vee B] \leftarrow [B]) \leftarrow$

● Q1 [B], [$\langle A \vee B\rangle$ is of the form $\langle \varphi \vee \psi\rangle$], [$\Box_{\vee}$ •(if p is of the form $\langle \varphi \vee \psi\rangle$ and ψ is true, then [p] $\leftarrow$ [ψ]].

We have not explored principles involving multiple occurrences of $\leftarrow$, but this example suggests that such principles sometimes make good sense.

Are these conjectures plausible? I can think of no likely counterexample to Formality. If Fred is handsome in virtue of his symmetrical features and deep green eyes, then anyone with a similar face would have to be handsome for the same reason. Particular grounding facts must always be subsumable under general laws, or so it seems. It would be interesting to know why this is so.

Mediation is much less obvious. It is closely analogous to Kit Fine's thesis that the modal facts are grounded in facts about the essences of things, and counterexamples to Fine's thesis would yield counterexamples to mediation. Consider a version of non-reductive materialism in the philosophy of mind according to which every fact about phenomenal consciousness is grounded in facts about the material organ of consciousness (in our case, the brain) even though no phenomenal property is reducible to any neurophysiological property or to any functional property that might be realized by a brain state. On this sort of view, I might be in pain in virtue of the fact that my c-fibers are firing, even though my being in pain would not *consist in* the firing or my c-fibers, nor in any disjunctive state of which c-fiber firing was a disjunct, nor in some existentially general state of which c-fiber firing was an instance. According to this non-reductive materialist, the *nature* of pain is exhausted by its phenomenal character; and yet, when my c-fibers are firing, I am always in pain in virtue of this fact *in the same sense in which a thing is square in virtue of being an equilateral rectangle*.

As another example, consider a Moorean position in metaethics according to which moral properties like *right* and *good* are indefinable, and yet every right act is right in virtue of possessing some right-making feature. To be more concrete, suppose that there is only one such feature, and that it is a natural feature: suppose that every right act is right in virtue of the fact that it would produce more happiness than any other option open to the agent. This view entails and to some extent explains the supervenience of the moral on the non-moral while

may ask: what grounds *this* general principle. And here a relatively natural answer suggests itself. It lies in the nature of *essence* that essentialist truths of the form $\Box_X$p should ground the corresponding fact that p. Part of what it is for it to be the case that $\Box_X$p is for this fact to ground the fact that p. *Essential grounding* is thus a law of grounding that is mediated by the nature of one of its constituents in the sense that we are presently trying to capture. Thanks to David Enoch on this point.

insisting that morality concerns a sui generis domain that in no way reduced to, or consists in, facts that might be formulated in other terms.

These views endorse general grounding principles of the sort required by Formality:

> For all x, if x's c-fibers are firing then [x is in pain] ← [x's c-fibers are firing].
>
> For all agents x and actions A, if x's doing A would maximize happiness then [A is right] ← [X's doing A would maximize happiness].

But when we cast about for some item whose nature might explain these general laws, we find no likely suspects. By hypothesis, the 'higher-level' properties (*pain, rightness*) do not have natures that make contact with the lower level properties invoked in the law. To put the point in epistemic terms, we are imagining views on which one might know everything there is to know about the nature of pain or rightness without knowing the first thing about c-fibers or happiness. The only alternative is that these grounding principles might be explained by reference to the natures of the relevant lower-level properties. Someone might suggest, for example, that while it does not lie in the nature of *pain* to be grounded in c-fiber firing, it lies in the nature of c-fiber firing that facts about it always ground states of pain. On this sort of view, the analgesic neuroscientist who knew everything about the detailed physiology of c-fibers and their role in the functional economy of the organism but who knew nothing about pain would have an incomplete understanding of *what it is* for a c-fiber to fire. But this is implausible. Of course he would obviously fail to know something important about c-fibers. But it is hard to see why his understanding of the *essence* or *definition* of this particular neurological kind should be defective.

Can we rule these positions out on principled grounds? The most promising strategy is to lean heavily on Fine's account of necessity—to insist that whenever p is a necessary truth, p must be grounded in the nature of some thing or things. The views in question are incompatible with this principle, since they posit general grounding principles which are presumably necessary if true at all, but which do not derive their truth from the natures of any of their constituents.

This poses a challenge for these views, but the case is not conclusive. Fine's position locates the ground of metaphysical necessity in a special stratum of fact—the facts about the essences of thing. An alternative position would identify the basic grounding principles as a further source of absolute necessity. On Fine's account, a truth is necessary (roughly speaking) when it is a logical consequence of the essential truths. On the alternative account, the necessary truths would be the consequences of the essential truths together with the basic grounding laws. This may seem untidy, but it is not clearly objectionable. I thus conclude, rather tentatively, that we cannot rule out the possibility of Moorean connections—general principles affirming that facts of one sort are grounded in facts of another sort, but which cannot be explained in terms of the essences of any of the items in question.

14. CONCLUSION

Philosophers often speak as if they believed that some facts obtain in virtue of others. We have indulged freely—some might say extravagantly—in this way of speaking, and having done so we may ask: Is there any reason not to take this idiom seriously? To do so would be to give oneself license to ask philosophical questions and to frame philosophical theses in terms of it, while conceding that one cannot define the grounding idiom in more basic terms. My strategy for approaching this question was simply to *use* the idiom for the purpose of framing general principles, and then to show how those principles might interact with other principles that we accept. My thought was simple: if the grounding idiom is seriously problematic, this project should soon break down. We should find ourselves landed in confusion or incoherence, accepting contradictory principles or not knowing what to say or how to proceed. My preliminary conclusion is that we do not find ourselves in this predicament. I have not tried to produce a complete theory of the 'in virtue of' relation. I have simply attempted to state some principles that might ultimately figure in such a theory. My claim is simply that at this stage we have no reason to doubt that an adequate theory of this sort might be attainable.

The project of rehabilitating the grounding idiom is analogous, as I see it, to the project begun in the 1960s for the rehabilitation of traditional notions of necessity and possibility—a project that is now more or less complete, and whose value is beyond dispute. The rehabilitation of the modal idiom did not proceed by definition or reduction. Definitions were sometimes proposed, but they were never widely accepted. Nor did it depend for its success on systematic axiomatization, as is shown by the fact that questions of *de re* modality—Could this lectern have been made of ice?—are widely regarded as intelligible despite the absence of single generally accepted system of quantified modal logic. Rather it proceeded by pointing out that once the relevant notions have been distinguished from others with which they are frequently confused (analyticity, apriority) we understand them well enough: we simply find ourselves with tolerably clear intuitions—i.e., beliefs—about necessity and possibility and moderately effective strategies for extending our knowledge by means of argument and analogy (Soames 2003). Systematic theory-building is obviously desirable; but it is not a prerequisite for regarding the modal notions as legitimate resources for philosophy.

The same goes, I believe, for the idioms of grounding, and also for the idioms of reduction and essential truth that I have invoked in this discussion. Needless to say, ye shall know them by their fruits. The strategy of acquiescing in these ways of speaking will be vindicated when they are put to use in making sense of some independently puzzling domain. I hope that I have provided grounds

for optimism about this project; but I do not pretend to have done more. My argument is principally addressed to those who resist these notions on the ground that they simply *do not understand them*. We have seen that it is possible to lay down a battery of plausible principles involving the disputed idiom and to develop arguments involving those principles. We have seen that it is possible to frame questions in this idiom that seem to be discussable. Given all of this, I ask: What would it take, beyond this, to establish the grounding idiom as a legitimate resource for metaphysics?

Queries in Chapter 6

Q1. Closing parenthesis missing. Please check.