

Grounding and modality¹

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1. Introduction

How is grounding related to modality? This question is ambiguous, since several phenomena fit under the broad label ‘modality’. First, we could ask whether grounds necessitate what they ground (“Grounding Necessitarianism”). Second, we could ask whether grounding is an internal relation, i.e. whether in every possible world in which some fact and its grounds obtain they automatically stand in the grounding relation. Third, we could ask how grounding is related to modal notions, in particular supervenience, which used to be assigned similar theoretical roles.

Alex Skiles’ contribution to this volume discusses the first and the second of these questions, and in the context of a broader discussion of meta-grounding, Jon Litland also touches on the second; the present entry will entirely focus on the relation between grounding and supervenience. But to fruitfully discuss this issue, we need a minimal regimentation of the target notions. I will treat grounding as a many-one relation between facts. I will use the ‘[‘, ‘]’ notation to form names of facts from sentences; so, ‘[A]’ should be read as ‘the fact that A’. I will also use small Greek letters for variables that range over facts and capital Greek letter for sets of facts (I will often represent the plurality of facts on the grounding side of the relation as a set of facts).² Unless noted otherwise, I will use ‘grounding’ for *full* and *factive* grounding. For the most part, I will bracket two further (otherwise important) questions: whether grounding is itself metaphysical explanation or instead a relation that “backs” such explanations (see Martin Glazier’s entry in this volume), and whether there is only one kind of grounding or many (see Kevin Richardson’s entry).

Supervenience is necessary co-variation: speaking in general terms, the A-entities supervene on the B-entities iff the A-entities cannot vary without some variation in the B-entities. We can distinguish various types of supervenience depending on the ontological category of the relata, the modal force with which they co-vary, and the scope of the supervenience thesis. To make the discussion manageable, I will narrow down my target notion in each of these three respects. First, although the specialized literature usually focuses on property supervenience (see McLaughlin and Bennett 2018), I will primarily focus on supervenience between facts. Since I already regimented grounding as a relation between facts, this will make it easier to detect interesting connections between grounding and supervenience. By default, I will take the supervenience base to be a set of facts (an assumption I will revisit in section 3). Second, since our topic is metaphysical grounding, I will require the modal force of co-variation to be at least as strong as metaphysical necessity. Third, I will focus on supervenience theses that assert patterns of co-variation between entire possible worlds (“global supervenience”) rather than co-variation within a possible world (“local supervenience”).³ Since our main focus is on the modal profile of grounding rather than its uniformity within a possible world, this too is a natural choice. With this minimal regimentation under our belt, I will discuss three questions: (1) can either grounding or supervenience be defined in terms of the other; (2) does either entail the other; (3) do their theoretical roles overlap to some extent?

2. Definition

Few explicitly offered supervenience-based analyses of grounding. Armstrong often treated supervenience as a grounding-like relation (see Armstrong 1997), but he arguably relied on a non-standard notion of supervenience (see Bricker 2006: 267–8). In recent work, however, Kris

McDaniel offers an actual analysis of grounding partly in terms of supervenience (I slightly rephrased his formulation to match our chosen regimentation):

(McDaniel's Thesis): [a is F] grounds [b is G] iff G supervenes on F and F is more natural than G (cf. McDaniel 2013: 12)

A similar criterion has been proposed by Philipp Bricker, albeit as a merely sufficient condition (here, too, I slightly revised his formulation):

(Bricker's Thesis): If a set of facts Γ are fundamental and a fact ϕ supervenes on Γ , then the facts in Γ ground ϕ (cf. Bricker 2006: 272)

The main difference between the two theses (beside Bricker's proposing only a sufficient condition of grounding) is that in the analysis clause McDaniel uses the relative notion of *being more natural than*, whereas Bricker uses the word 'fundamental' for Lewis's (1983) notion of a *perfect naturalness* (originally devised for properties but often extended to facts).

These differences won't matter much here; the two proposals face similar problems. Take the fact [2 is an even number] and some arbitrary fundamental microphysical fact, say, [electron e has negative charge]. Intuitively, neither [2 is an even number] nor the property of being an even number is fundamental. On the assumption that the facts of pure mathematics are necessary, [2 is an even number] trivially supervenes on [electron e has negative charge] (no two worlds can differ with respect to the former without differing with respect to the latter, since they cannot differ with respect to the former *period*). For similar reasons, the *property* of being an even

number also trivially supervenes on the property of having negative charge (as McDaniel's definition requires). Yet it seems implausible that [2 is an even number] is grounded in [e_1 has negative charge].

This example spells trouble for both McDaniel's and Bricker's Thesis. It also exemplifies an important difference between supervenience and grounding, which will come up in the discussion to follow from time to time: grounding is a hyperintensional relation at least in the sense that (unlike supervenience) it doesn't automatically hold between pairwise necessarily coextensional relata (cf. McLaughlin 1995). Now, Bricker's and McDaniel's Theses also appeal to naturalness, and we cannot in advance rule out a reductive definition of grounding in terms of supervenience and some other (hyperintensional) notion. But it's not clear how such a definition would go, and most contributors to the grounding literature aren't optimistic about the prospects of finding one.

Could we instead define supervenience in terms of grounding? Since supervenience is defined in modal terms, this question boils down to whether we can dispense with primitive modality in favor of grounding-theoretic notions. While many philosophers are sympathetic to the idea that grounding facts are prior to modal facts, few endeavored to offer a straightforward grounding-based *analysis* of modality. What comes closest is a recent proposal by Boris Kment, who offers the following definition of metaphysical necessity:

(Law Analysis) A proposition is metaphysically necessary iff it is true throughout the sphere around actuality that contains the worlds that match actuality with respect to the metaphysical laws (2014: 188)

Kment uses the word ‘world’ neutrally for possible *as well as impossible* worlds. A “sphere around actuality” is a class of worlds each member of which is closer to the actual world than any world not in the class; Kment thinks that the class of worlds that matches ours with respect to the metaphysical laws forms just such a sphere. Third, Kment doesn’t define ‘metaphysical law’; he accepts the notion as a primitive. If this analysis is correct, we could use it to analyze supervenience by replacing the modal idiom in it with its analysans (see Tobias Wilsch’s entry to this volume for more on grounding and metaphysical laws).

One might try to turn the Law Analysis into a directly grounding-based one by understanding metaphysical lawhood in terms of grounding. A relatively straightforward way of doing so has been offered by Glazier (2015: 23–26), who understands law statements as generic grounding statements that feature a primitive variable-binding operator. Kment himself spells out the connection between grounding and metaphysical laws differently and maintains that grounds, in conjunction with the metaphysical laws, metaphysically explain what they ground. So there are two kinds of metaphysical explanantia, grounds and metaphysical laws, just like there are two kinds of scientific explanantia, causes and natural laws (Kment 2014: 164).

This means that if we accept both grounding and metaphysical explanation as primitives, we can use them to define metaphysical laws. To be clear, Kment himself offers no such definition; the forthcoming analyses are inspired by Kment’s work, but he would likely reject them. Our task would be easier on the (controversial) assumption that no world contains uninstantiated laws: then we could say that in any world w , L is a metaphysical law iff for a set of facts Γ and a fact ψ (each distinct from L), the members of Γ fully ground ψ , L and the members of Γ together fully metaphysically explain ψ , and L is not even a partial ground of ψ . Things are more complicated if we allow for uninstantiated laws (as Kment does); in that case, the following

revision may be proposed: for any world w , L is a metaphysical law iff either (i) for some set of facts Γ and some fact ψ (each distinct from L), the members of Γ fully ground ψ , L and the members of Γ together fully metaphysically explain ψ , and L is not even a partial ground of ψ , (ii) or if L is uninstantiated, then for some set of facts Γ and some fact ψ (each distinct from L), if L and the members of Γ together fully metaphysically explained ψ , then the members of Γ would fully ground ψ and L would not even be a partial ground of ψ .

If one of these analyses is on the right track, we can get a definition of metaphysical supervenience ultimately in terms of worlds, grounding, metaphysical explanation, and (if we allow uninstantiated metaphysical laws) counterfactuals. The resulting definition would be a highly complicated one with several subordinate clauses, and I won't attempt to spell it out here. However, one might also wonder whether such an involved analysis would be worth the benefits in the first place. One commonly acknowledged advantage of supervenience is its relative neutrality; philosophers with very different views on the intelligibility and utility of concepts like grounding, metaphysical laws and the like can nonetheless agree on various supervenience theses (cf. Kathrin Koslicki's entry on skeptical doubts about grounding and Louis deRosset's about responses to them). By accepting the Kment-inspired analysis, we risk tying the reasonably uncontroversial tool of supervenience to the much more contentious ideology of grounding and metaphysical explanation. More cautiously: even if the good standing of supervenience as a philosophical notion doesn't depend on the standing of the grounding-theoretic notions used to analyze it, one might still worry that specific (and relatively uncontroversial) supervenience theses shouldn't hang on the truth of more controversial claims about grounding and metaphysical explanation. Similar remarks apply to Glazier's view.

I leave it to the reader to weigh these concerns against the advantages of having a non-modal analysis of supervenience. There may also be grounding-theoretic analyses other than the two mentioned above. However, I won't dwell on exploring these here; instead, I will move on to a more widely discussed link between grounding and supervenience, that of metaphysical entailment.

3. Entailment

Does either of grounding and supervenience metaphysically entail the other? It doesn't seem that any kind of supervenience is by itself sufficient for grounding. The cases that spelled trouble for Bricker's and McDaniel's "naturalness-enhanced" sufficient conditions for grounding *a fortiori* frustrate any attempt to derive grounding from supervenience alone.

It has been much more common to assume that at least grounding entails supervenience, i.e. that no two possible worlds can differ with respect to a grounded fact unless they also differ with respect to its grounds. Indeed, grounding is often motivated by remarks to the effect that supervenience is "too weak" for certain purposes or that grounding does everything supervenience does *and some more*, which implies that supervenience is a necessary (even if not sufficient) condition of grounding (see, e.g., Fine 2012: 41, Kment 2014: 14, and Schaffer 2016: 61 ff10). Yet most attempts to formulate a precise link between grounding and supervenience face difficulties. To see why, start with the following thesis:

Simple Supervenience (SimSup): If the facts in Γ ground ϕ , then any two possible worlds that are indiscernible with respect to Γ are also indiscernible with respect to ϕ

As Leuenberger (2014a) points out, widely accepted cases of grounding violate SimSup. Grounding is normally thought to allow for multiple realization, which in turn gives rise to counterexamples to SimSup. Suppose (as standardly assumed) that disjunctions are fully grounded in their true disjuncts (see Michaela McSweeney's entry on the relation between grounding and the truth-functional connectives). Take a contingent disjunctive fact $[A \vee B]$; suppose it's grounded by $[A]$, and that A and B are independent from each other. Since both disjuncts are contingent, there is a possible world w_1 in which A is false but B is true, and another one, w_2 , in which both are false. These two worlds falsify the supervenience of $[A \vee B]$ on $[A]$: w_1 and w_2 are indiscernible with respect to $[A]$ but not with respect to $[A \vee B]$, yet $[A]$ grounds $[A \vee B]$. Similar counterexamples can be constructed using the general recipe of finding a fact with multiply realizable grounds and two possible worlds that differ with respect to the grounded fact but not with respect to its actual-world grounds (absent from both worlds but replaced with an alternative ground in only one of them). For example, facts about determinable properties are often thought to be grounded by facts about their determinates (Schnieder 2006: 32–33, Rosen 2010: 126, Audi 2012: 686, 689, Schaffer 2012: 126–27 and 2016: 54). If so, then the fact that the beer bottle is green is grounded in the fact that it has a particular shade of green, say, green_{14} . But there is a pair of possible worlds, one where the bottle is green_{21} and another where it's brown. These worlds differ with respect to whether the beer bottle is green but not with respect to whether it has shade green_{14} . Yet in the actual world, [the bottle is green_{14}] plausibly grounds [the bottle is green].

One reaction to these counterexamples is to reject them. A particularly interesting way of doing so has been proposed by Guigon (2018) against the backdrop of a general counterpart-theoretic account of grounding. Most of its details need not concern us here; what matters is that

according to Guigon, facts are world-bound and modal truths about their grounding status are properly analyzed as truths about their *counterparts*. Importantly, Guigon also borrows Lewis's (2003) "qua" locution as a context-fixing device and maintains that if some fact ϕ is grounded by some set of facts, Γ , then any possible grounds of ϕ are "truths *qua* grounds": they are ways the facts in Γ could be. That is, if a set of facts Γ ground ϕ , then by taking any possible world in which some set of facts, Δ , ground a counterpart of ϕ , we thereby fix a context in which the facts in Δ are counterparts of the facts in Γ . For instance, while there is a possible world w in which [The bottle is green] is grounded by [the bottle is green₂₁], this latter fact is a counterpart of the actual fact [the bottle is green₁₄]. Moreover, all possible grounds of [The bottle is green] are ways its actual grounds could be. Thus, we can reconcile multiple realizability with the supervenience of the grounded on its grounds: in some worlds facts are grounded differently, yet they are grounded by the same facts *qua* grounds as in the actual world.

A natural way to proceed for those who are not prepared to adopt Guigon's counterpart-theoretic approach is to weaken SimSup. This is Leuenberger's own strategy. As he notes, one common feature of counterexamples like those mentioned above is that they involve a pair of possible worlds, neither of which contains the actual-world grounding fact. It's natural to react to such scenarios by restricting the scope of our supervenience thesis to pairs of worlds one member of which is the actual world. Leuenberger calls this "actuality-sensitive supervenience": fact ϕ actuality-sensitively supervenes on a set of fact, Γ , iff any world that differs from the actual world with respect to ϕ also differs from it with respect to Γ . The corresponding grounding thesis would then go as follows:

Actuality-sensitive Supervenience (AcSup): If the facts in Γ ground ϕ , then any possible world that is indiscernible from the actual world @ with respect to Γ is also indiscernible from @ with respect to ϕ

As Leuenberger points out supervenience *per se* plays no distinctive role in AcSup, since in the case of any actually obtaining facts, AcSup turns out to be equivalent to grounding necessitarianism. For the supervenience-to-entailment direction suppose that some fact, [A], actuality-sensitively supervenes on some set of facts Γ . Take a world w in which the facts in Γ obtain. Since [A] actuality-sensitively supervenes on Γ , it also obtains in w . So, Γ entails [A]. For the entailment-to-supervenience direction, suppose that that all members of Γ obtain and Γ entails [A]. Take a world w in which all members of Γ obtain. Since Γ entails [A], [A] also obtains in w . But then if w and @ are indiscernible with respect to Γ they are also indiscernible with respect to [A], and so [A] actuality-sensitively supervenes on Γ . Reading these two results together, we get the desired biconditional that grounding satisfies AcSup if and only if Grounding Necessitarianism is true.

Since AcSup is equivalent to Grounding Necessitarianism, I won't discuss it here; presumably, the arguments for and against them will be the same, and Grounding Necessitarianism is already discussed in Alex Skiles' separate entry. Instead, I will consider another fix suggested by Leuenberger. We originally considered supervenience as a relation between a set of facts and a particular fact. But in informal contexts, supervenience is often treated as a relation between *types* of facts, where types aren't simply individuated by their members (formally, they can be represented by functions from worlds to set of facts). For example, we often say that mental facts supervene on physical ones or that general facts

supervene on particular facts. But these statements are not plausibly interpreted as talking about the relation between the sets of those mental facts and those physical facts, or those general and particular facts, which happen to obtain in the actual world. Following Leuenberger, let ‘ T_Γ ’ stand for the maximal type to which the members of Γ belong; that is, the type to which each member of Γ belongs and to which no further fact in $@$ belongs. Then we can formulate the following thesis:

Type Supervenience Thesis (TypSup): If the facts in Γ ground ϕ , then any two possible worlds that are indiscernible with respect to T_Γ are also indiscernible with respect to ϕ

Our earlier counterexamples seem ineffective against TypSup. Take again the beer bottle example. As we have seen, the bottle’s being green is grounded in but doesn’t supervene on its being green₁₄. But the bottle’s being green does appear to supervene on its determinate color properties (where “determinate color properties” count as a type). After all, although the pair of cases in our counterexample don’t differ with respect to being green₁₄ (neither is of that shade), they do differ with respect to their determinate color properties (one of them is green₂₁ while the other isn’t). Likewise for the disjunction case: if A is true in $@$ but false in w_1 and w_2 whereas B is true in w_1 but false in w_2 , then even though w_1 and w_2 don’t differ with respect to [B], they still differ with respect to “the disjuncts of $[A \vee B]$ ”.

Leuenberger notes two problems with TypSup, which he calls the *reference type problem* and the *problem of heterogeneous realizers*. Let’s start with the reference type problem. The problem is simply that the notion of a type at issue is not entirely clear, since any set of facts can plausibly be associated with multiple types at the same time. This means that type supervenience

theses are not well defined. One potential remedy Leuenberger suggests is to differentiate between natural and non-natural fact types, analogously to Lewis's (1983) familiar distinction between natural and non-natural properties. Naturalness is usually taken to be unanalyzable, but natural properties have a number of distinctive features. What's most important in the present context is that they make for similarity among their instances. The generalization of naturalness-theoretic ideology beyond properties is not unprecedented (see especially Sider 2011; also recall our earlier discussion of Bricker 2006), and Leuenberger takes it to be an important mark of natural fact types that they comprise objectively resembling facts. We can try to solve the reference type problem by narrowing down initially ambiguous type supervenience theses to ones phrased in terms of natural fact types (and perhaps in terms of the most natural fact types the respective facts belong to) that satisfy the following two further constraints: (i) the actual members of a type T_Γ are all and only the members of Γ , and (ii) a fact's membership in a type is essential: if ϕ obtains in two possible worlds, w_1 and w_2 , then ϕ is $\in T_\Gamma$ at w_1 iff $\phi \in T_\Gamma$ at w_2 . To see how the introduction of naturalness could help us select the right type, take the following example. The type that involves the mass facts in the actual world and the mass facts in other possible worlds is more natural than the fact type that involves the mass facts in the actual world and facts about charge in some other possible world. Hence, ' $T_{\{\text{the mass facts in } @\}}$ ' plausibly refers to a type of fact to which other (non-actual) mass facts also belong.

In a recent paper, Samuele Chilovi (forthcoming) raises a number of objections to Leuenberger's treatment of the reference type problem. He begins by objecting to Leuenberger's first constraint that the actual members of a type T_Γ are all *and only* the members of Γ . Facts of a certain type T , Chilovi argues, might ground another fact without being the only facts of type T . For example, not all the physical facts are relevant to grounding some particular mental fact, yet

it's intuitive to say that the mental facts are grounded in physical facts. This problem can be fixed by simply relaxing the 'and only' proviso and allowing for non-maximal fact types in supervenience theses. A more serious worry, according to Chilovi, is that the naturalness constraint won't always deliver the intuitively appropriate fact type. Suppose we want to formulate in terms of fact types the idea that the general supervenes on the particular. Take a world, w , in which there are only two individuals, a and b , each instantiating some very natural chemical property F . Now, $[Fa]$ and $[Fb]$ belong to at least two different fact types: they are both *particular facts* as well as *chemical facts*. According to the criterion of similarity-making (which Leuenberger heavily relies on) the type *chemical fact* is more natural than the type *particular fact*, since on the whole chemical facts are less miscellaneous than particular facts. Yet when we said that the general facts supervened on the particular facts, we didn't use the phrase 'particular facts' to pick out the type *chemical fact*; moreover, understood that way the supervenience claim isn't even plausible (there may well be worlds chemically indistinguishable from ours that nonetheless differ with respect to the general facts obtaining in them). Chilovi concludes that there's no mechanical, context-invariant method of pinning down the type in terms of which a supervenience claim is best formulated; instead, we should settle for an intuitive understanding of TypSup and let contextual factors determine what the relevant type at issue is.

Let's move on to the problem of heterogeneous realizers. Here, the problem is that some facts could have been grounded by facts numerically distinct from the actual grounds that don't even belong to the same type. For example, perhaps the mental facts are grounded by physical facts in the actual world but alien "ectoplasmatic" facts in some other possible worlds. Take two such worlds, w_1 and w_2 ; suppose Jim is in pain in w_1 but not in w_2 . Since both w_1 and w_2 are ectoplasmatic, there doesn't have to be any physical difference between them. So, it seems that

the mental facts could be grounded in the physical facts without supervening even on physical types of facts.

To deal with the problem of heterogeneous realizers, Leuenberger proposes a weakened supervenience thesis that merely asserts necessary co-variation between a fact's actual-world and merely possible types of grounds:

Actuality-sensitive Type Supervenience Thesis (AT-Sup): If the facts in Γ ground ϕ , then any possible world that is indiscernible from @ with respect to T_Γ is also indiscernible from @ with respect to ϕ

Unlike AcSup, AT-Sup requires only that if a world w differs from ours with respect to an actually obtaining grounded fact, it also differ with respect to the type of facts that ground it. That is, even if [B] is a fact in @ but not in w , its actual-world grounds Γ might hold in w so long as w differs from @ in some of the *other* T_Γ -type facts. AT-Sup is also strictly weaker than Grounding Necessitarianism (this can be most easily seen by observing that it is entailed by but doesn't entail AcSup, which as we have seen is equivalent with Grounding Necessitarianism) and deserves to be discussed in its own right.

While AT-Sup is immune to the problem of heterogeneous realizers, it might falter on other puzzle cases. Leuenberger mentions one of these, the *problem of heterogeneous blockers*. Put in intuitive terms, blockers are non-actual facts that, when added to the full grounds of an actually obtaining fact ϕ , prevent ϕ from obtaining in another possible world. Blockers already pose a challenge to AcSup (which was formulated in terms of sets of facts and not discussed in detail). But *heterogeneous* blockers also threaten AT-Sup, since they appeal to alien types of extra facts

doing the preventing work. Suppose, for instance, that the mental facts are grounded in physical facts. Leuenberger asks us to imagine a possible world in which the same physical facts obtain, but there is also some alien substance (“chromoplasm”) that prevents our physical duplicates from undergoing pain. If such a scenario is possible, then grounding doesn’t even guarantee the supervenience of the grounded on the type of fact to which the actual grounds belong.

Now, as Leuenberger notes, the possibility of heterogeneous blockers is contentious. More cautiously, it doesn’t seem especially dogmatic to insist that if chromoplasm-style scenarios are possible, they are simply counterexamples to the original grounding theses rather than to the relevant instance of AT-Sup. This is exactly how Chilovi responds, who maintains that if chromoplasm really is possible, then the mental facts aren’t, after all, grounded in the physical facts. In place of the problem of heterogeneous blockers, Chilovi raises what he considers a more serious problem: the *problem of heterogeneous grounding bases*, which threatens both TypSup and AT-Sup as formulated above. The worry, in a nutshell, is that even in the actual world we have no compelling reason to think that for every fact there is exactly one type to which all of its grounds belong. For example, facts about cities may be grounded in facts about geography and sociology, and legal facts may be grounded in social as well as moral facts. To overcome this problem, Chilovi proposes a revision of AT-Sup in which the supervenience base is a plurality of types:

Actuality-sensitive Plural Type Supervenience Thesis (PluSup): If the facts in Γ ground ϕ , then any possible world that is indiscernible from $@$ with respect to $T_{\Gamma_1} \dots T_{\Gamma_n}$ is also indiscernible from $@$ with respect to ϕ (where two worlds, w_1 and w_2 , are indiscernible

with respect to $T_{\Gamma_1} \dots T_{\Gamma_n}$ iff T_{Γ_1} at $w_1 = T_{\Gamma_1}$ at w_2 , T_{Γ_2} at $w_1 = T_{\Gamma_2}$ at w_2 , ..., T_{Γ_n} at $w_1 = T_{\Gamma_n}$ at w_2)

This revised formulation is promising and seems resistant to many of the problems that beset simpler versions. Of course, questions still remain as to whether we can get a more rigorous characterization of types than Chilovi's context-sensitive proposal and about whether PluSup could be generalized beside the actual world. Moreover, the jury is still out on how we should evaluate scenarios involving heterogeneous blockers. In comparison to Grounding Necessitarianism, the grounding-supervenience link is a relatively under-researched topic, possibly at least in part due to technical difficulties about proper formulation that don't arise with Grounding Necessitarianism.

4. Grounding, supervenience, and their theoretical roles

In contemporary discussions, grounding is usually invoked to play theoretical roles that were often assigned to supervenience before the recent surge of interest in grounding. This being said, at least Leuenberger is skeptical about this overlap: if the counterexamples to the various proposed grounding-supervenience links are genuine, he says, then we should see grounding and supervenience as complementary tools rather than rival characterizations of the same pre-theoretical notion (2014a: 239). However, even if grounding and supervenience are not rival characterizations of the same notion, it's worth asking whether their theoretical roles at least partially overlap. Two potential (and in the case of grounding, fairly uncontroversial) roles come to mind: a "fundamentality-tracking" and an explanatory role. Can supervenience play either of these roles?

Let's start with fundamentality. Grounding is commonly used to define absolute fundamentality: a fact is (absolutely) fundamental iff nothing grounds it. Moreover, there is often thought to be a tight conceptual link between grounding and relative fundamentality: if a fact, ϕ , partially grounds another fact, ψ , then ϕ is more fundamental than ψ . (This is merely a sufficient not a necessary condition of relative fundamentality, since there may be facts that stand in the *more fundamental than* relation without being ground-related at all. For more on the relation between grounding and fundamentality, see Ricki Bliss's contribution to this volume.)

These conceptual links between grounding and fundamentality are useful, but they have a limitation: the grounding-theoretic definition gives us no guidance as to how we should evaluate the fundamentality status of things other than facts, for example properties. One way to go would be to assume that facts are structured and try to read off the fundamentality status of properties from that of the facts they are constituents of. For example, one could say that a property is fundamental just in case it's a constituent of at least one fundamental fact. However, this proposal faces problems. For one, it appears to rule out fundamental properties that are uninstantiated and thus don't feature in any facts. For another, it implies (perhaps objectionably) that if a property is a constituent of a fundamental fact only in some non-actual world, then that property is merely contingently non-fundamental. And even aside from these issues, one might want a handle on property fundamentality that is independent of the metaphysics of facts. (See also Tuomas Tahko's entry on structure for a discussion of related issues).

Supervenience might come handy here. When characterizing perfectly natural properties (which many take to be the fundamental properties), one of the theoretical roles Lewis (1983) attaches to them is that they constitute a complete supervenience base for all other properties. That is, the pattern of instantiation of all properties supervenes on the pattern of instantiation of

the perfectly natural (fundamental) properties. So, if a property F is fundamental, then it's the member of a set of properties $\{F_1 \dots F_n\}$ such that all facts supervene on the distribution of $F_1 \dots F_n$. Obviously, this is not a sufficient condition of perfect naturalness, since the distribution of various sets of gerrymandered, non-natural properties may also provide a complete supervenience base (cf. Sider 1996, Schaffer 2004, 2010 and Dorr and Hawthorne 2013); still, this partial characterization at least gives us some means of figuring out whether a certain set of properties are fundamental.

Needless to say, there is much more to be said about the relation between fundamentality and supervenience. But we can cautiously say at least that even if the grounding-based definition of fundamentality is correct, supervenience can serve as a useful extra tool in this area. By bearing different links to fundamentality that can't simply be read off each other, grounding and supervenience might usefully complement each other in giving us a fuller understanding of this notion.

What about explanation? The contemporary consensus is that supervenience is not itself an explanatory relation; indeed, one commonly cited justification for introducing grounding is that it can play an explanatory role supervenience is not suitable for. However, the exact reason for this commonly held view is not entirely clear, and the orthodoxy has lately been criticized in a recent paper by David Kovacs (2019). There is no doubt that part of the difficulty stems from the unclarity of the expressions 'explanatory relation' and 'backing'. Below I will consider a few commonly used rationales for the supposed explanatory impotence of supervenience and mention some reasons for not taking them to be conclusive.

One popular complaint against supervenience is that it has the wrong formal properties to be an explanatory relation: explanation is irreflexive, asymmetric and non-monotonic, whereas

supervenience is reflexive, non-symmetric and monotonic (cf. Schaffer 2009: 364, McLaughlin and Bennett 2018: §3, §5, and Raven 2012: 690). That is, everything supervenes on itself, sometimes two distinct facts or sets of facts supervene on each other, and for any fact ϕ and its supervenience base Γ , the base amended by some arbitrary extra fact ψ still serves as a supervenience base for ϕ . However, it is unclear how much of a wedge these differences put between grounding and supervenience. First, the irreflexivity and asymmetry of grounding are not entirely uncontroversial; some authors take seriously the possibility of self-grounding and mutual grounding, yet they take grounding to be an explanatory relation (see also Francesca Poggiolesi's, Stephan Kramer's and Naomi Thompson's contributions to this volume for more on the formal features of grounding.) Second, as Berker (2018) showed, if the main issue with supervenience lied in its formal properties, we could easily fix this problem by adding those properties by fiat. That is, instead of supervenience we could focus on "proper supervenience" (supervenience that is asymmetric and irreflexive) and insist that *that* relation is explanatory (though see Raven 2012: 690 for an objection to this move.) Third, as Kovacs notes, we can use a similar trick to ensure non-monotonicity. So in the end, we can simply direct our attention to proper supervenience, the relation that holds between ϕ and Γ iff (i) ϕ supervenes Γ , (ii) Γ doesn't supervene ϕ , and (iii) there is no proper subset of Γ on which ϕ supervenes.

Another popular argument against the explanatoriness of supervenience is that it's an intensional relation: if ϕ supervenes on Γ , then any fact that holds in the same possible worlds as ϕ supervenes on any set of facts that hold in the same possible worlds as Γ . This is not thought to be true of explanation, which may vary between pairwise cointensional relata. However, Kovacs (2019) argues that this cannot be the right diagnosis of the supposed unexplanatoriness of supervenience, since proper supervenience (as defined above) is non-monotonic. The non-

monotonicity is ensured by the minimality requirement: if ϕ properly supervenes on Γ , it doesn't properly supervene on any superset of Γ .

A third objection is that supervenience doesn't *guarantee* explanation: it's obviously not the case that if ϕ supervenes on Γ then the facts in Γ explain ϕ . Grounding, on the other hand, is always explanatory: if the facts in Γ ground ϕ then they also explain it (cf. Audi 2012: 687–688, Schaffer 2009: 364–365, 2016: f52, Rosen 2010: 110–114 and Fine 2012: 41).

This is a more promising justification of the supposed unexplanatoriness of supervenience, but it still raises questions. For one, even if grounding is always explanatory, this is not clearly true of all paradigmatic explanatory relations. For example, there is a good case to be made that causes don't always explain their effects; in a deterministic world the Big Bang is causally sufficient for John's being late for school on a certain day but doesn't explain it. For another, if grounding is indeed a relation that always by itself suffices for explanation, one may wonder why. It would be bad news if it turned out that our very concept of grounding is simply "that-which-ensures-metaphysical-explanation"; for just like the natural, worldly relation of causation is unlikely to answer all our intuitions concerning puzzle cases about high-level causation, so is a natural relation of grounding (assuming there is one) unlikely to exactly line up with our intuitions about metaphysical explanation. So, whether the mere failure of supervenience to guarantee explanation is by itself sufficient to distinguish it from properly explanatory relations is at the very least an open question (Kovacs 2017: 2936–39; 2019: 1978–80).

Finally, one could take inspiration from Kim (1988/1993: 167), who famously claimed that supervenience was a "surface relation": in every case when supervenience tracks explanation, there is a deeper underlying relation ultimately responsible for whatever explanatory "oomph" we might have wanted to attribute to supervenience (cf. Horgan 1993, Kim 1998: 84ff, and

Wilson 1999). But as above, the tricky question is whether we cannot say similar thing about paradigmatic explanatory relations, including perhaps grounding itself. An increasingly influential strand of theorizing ties grounding to essence, and according to one version of this view, grounding obtains in virtue of links of essential connectedness between the grounding relata (or constituents thereof).⁴ If a view along these lines is true, then the relation ultimately responsible for whatever explanatory connection is tracked by grounding is essential connectedness (cf. Glazier 2017). But grounding essentialists wouldn't on that account conclude that grounding is a "surface relation" in the objectionable sense supervenience is.

To be sure, this is hardly the last word on the issue, and there *is* something intuitive about the popular slogan that supervenience is not an explanatory relation. So, Kovacs's challenge could also be read as an invitation to get more precise about what the slogan means and in what sense we should take it to be true. Exactly how grounding and supervenience are related to fundamentality and explanation is a vexed question, and we cannot rule out some overlap between the two relations' theoretical roles. Yet this isn't necessarily a bad thing. Even if supervenience is linked to fundamentality and explanation more closely than usually assumed these days, it's clearly linked very differently from the way grounding is. If so, then grounding and supervenience can usefully complement each other in helping us gain a better understanding of these adjacent notions.

Related topics

For the modal consequences of grounding see Alexander Skiles' chapter on necessity and internality; for the latter, see also Jon Litland's chapter on meta-grounding. For the role of laws in grounding explanation, see Tobias Wilsch's chapter on laws. In connection to the extent to

which grounding and supervenience can play explanatory and fundamentality-tracking roles see Martin Glazier’s chapter on explanation, Ricki Bliss’s chapter on fundamentality and Tuomas Tahko’s chapter on structure.

References

- Audi, Paul (2012), “Grounding: Toward a theory of the *in-virtue-of* relation,” *Journal of Philosophy*, 109: 685–711
- Bennett, Karen (2004), “Global Supervenience and Dependence,” *Philosophy and Phenomenological Research*, 68: 501–529
- Bennett, Karen (2017), *Making Things Up*, Oxford: Oxford University Press
- Berker, Selim (2018), “The unity of grounding,” *Mind*, 127: 729–77
- Bricker, Philipp (2006), “The Relation between General and Particular: Entailment vs. Supervenience”, *Oxford Studies in Metaphysics*, 2: 251–187
- Chilovi, Samuele (forthcoming), “Grounding entails supervenience,” *Synthese*
- Correia, Fabrice (2013), “Metaphysical Grounds and Essence,” in Miguel Hoeltje, Benjamin Schnieder & Alex Steinberg (eds.), *Varieties of Dependence: Ontological Dependence, Grounding, Supervenience, Response-Dependence*, Philosophia Verlag
- Correia, Fabrice (2014), “Logical Grounds,” *Review of Symbolic Logic*, 7: 31–9
- Correia, Fabrice & Benjamin Schnieder (2012), “Grounding: an opinionated introduction,” in Correia and Schnieder
- Correia, Fabrice & Alexander Skiles (2019), “Grounding, Essence, and Identity,” *Philosophy and Phenomenological Research*, 98: 642–70

- Dasgupta, Shamik (2014), "The possibility of physicalism," *Journal of Philosophy*, 111: 557–592
- Dorr, Cian & John Hawthorne (2013), "Naturalness," *Oxford Studies in Metaphysics*, 8: 3–77
- Fine, Kit (2001), "The Question of Realism," *Philosophers' Imprint*, 1 (1)
- Fine, Kit (2012), "Guide to Ground," in Correia and Schnieder
- Fine, Kit (2015), "Unified Foundations of Essence and Ground," *Journal of the American Philosophical Association*, 1: 296–311
- Glazier, Martin (2015), "Laws and the Completeness of the Fundamental," in Mark Jago (ed.), *Reality Making*, Oxford: Oxford University Press
- Glazier, Martin (2017), "Essentialist Explanation," *Philosophical Studies*, 174: 2871–2889
- Guigon, Ghislain (2018), "Truths *qua* Grounds," *Philosophy and Phenomenological Research*, 97: 99–125
- Hoffman, Vera and Albert Newen (2007), "Supervenience of Extrinsic Properties," *Erkenntnis*, 67: 305–319
- Horgan, Terence (1993), "From Supervenience to Superdupervenience: Meeting the Demands of a Material World," *Mind*, 102: 555–86
- Kim, Jaegwon (1988/1993), "Supervenience for multiple domains," in *Supervenience and Mind*, Cambridge: Cambridge University Press
- Kim, Jaegwon (1998), *Mind in a Physical World*, Cambridge, MA: MIT Press
- Kment, Boris (2014), *Modality and Explanatory Reasoning*, Oxford University Press
- Kovacs, David Mark (2017), "Grounding and the Argument from Explanatoriness," *Philosophical Studies*, 174: 2927–2952

- Kovacs, David Mark (2019), “The myth of the myth of supervenience,” *Philosophical Studies*, 176:1967–1989
- Leuenberger, Stephen (2014a), “From Grounding to Supervenience?,” *Erkenntnis*, 79: 227–240
- Lewis, David K. (1983), “New Work for a Theory of Universals,” *Australasian Journal of Philosophy*, 61: 343–377
- Lewis, David K. (2003), “Things Qua Truth-makers,” H. Lillehammer & G. Rodriguez-Pereyra, (eds.), *Real Metaphysics: essays in honour of D.H. Mellor*, London: Routledge
- Litland, Jon (2017), “Grounding ground”, *Oxford Studies in Metaphysics*, 10: 279–316
- McDaniel, Kris (2013), “Degrees of Being,” *Philosophers’ Imprint*, 13 (19): 1–18
- McLaughlin, Brian (1995), “Varieties of Supervenience,” in Elias E. Savellos & U. Yalcin (eds.), *Supervenience: New Essays*, Cambridge University Press, 16–59
- McLaughlin, Brian and Bennett, Karen, “Supervenience”, *The Stanford Encyclopedia of Philosophy* (Spring 2018 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2018/entries/supervenience/>.
- Petrie, Bradford (1987), “Global Supervenience and Reduction,” *Philosophy and Phenomenological Research*, 48: 119–30
- Raven, Michael (2012), “In Defence of Ground”, *Australasian Journal of Philosophy*, 90: 687–701
- Rosen, Gideon (2010), “Metaphysical dependence: grounding and reduction,” in Bob Hale and Aviv Hoffman (eds.), *Modality: Metaphysics, Logic, and Epistemology*, Oxford: Oxford University Press
- Schaffer, Jonathan (2004), “Two Conceptions of Sparse Properties,” *Pacific Philosophical Quarterly*, 85: 92–102

- Schaffer, Jonathan (2009), “On what grounds what,” in Chalmers et al
- Schaffer, Jonathan (2012), “Grounding, Transitivity, and Contrastivity,” in Correia and Schaffer
- Schaffer, Jonathan (2016), “Grounding in the Image of Causation,” *Philosophical Studies*, 173: 49–100
- Schnieder, Benjamin (2006), “Truth-making without truth-makers,” *Synthese*, 152: 21–46
- Shagrir, Oron (2002), “Global Supervenience, Coincident Entities and Anti-individualism,” *Philosophical Studies*, 109: 171–196
- Sider, Theodore (1996), “Intrinsic Properties,” *Philosophical Studies*, 83: 1–27
- Sider, Theodore (1999), “Global Supervenience and Identity Across Times and Worlds,” *Philosophy and Phenomenological Research*, 59: 913–37
- Sider, Theodore (2011), *Writing the Book of the World*, Oxford: Clarendon Press
- Skiles, Alexander (2015), “Against Grounding Necessitarianism,” *Erkenntnis*, 80: 717–51
- Stalnaker, Robert (1996), “Varieties of Supervenience,” *Philosophical Perspectives*, 10: 221–41
- Wilson, Jessica (1999), “How super-duper does a physicalist supervenience need to be,” *Philosophical Quarterly*, 50: 33–52

Further reading

- Duncan, Michael & Kristi Miller & James Norton (2017), “Is Grounding a Hyperintensional Phenomenon?,” *Analytic Philosophy*, 58: 297–329 (explores what it means for grounding to be a hyperintensional relation, and whether that thesis is true)

Leuenberger, Stephan (2014b), “Grounding and Necessity,” *Inquiry*, 57: 151–174 (a paper on grounding necessitarianism that complements Leuenberger’s arguments against the grounding-supervenience link)

Raven, Michael (2016), “Fundamentality without Foundations,” *Philosophy and Phenomenological Research*, 93: 607–626 (distinguishes two notions of fundamentality, ineliminability and foundationality, which play different theoretical roles)

Steinberg, Alex (2013), “Supervenience: A Survey,” in Hoeltje et al (a survey of various notions of supervenience and their relations to grounding and dependence)

Bibliographical note

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¹ For many helpful comments and criticisms I thank Kit Fine, Mike Raven, Alex Skiles, and participants of the 2018 Hamburg Workshop on Metaphysical Grounding.

² The “relations between facts” view of grounding has been adopted by Rosen 2010, Audi 2012, Raven 2012, Skiles 2015, and many others. Contrast this with Fine 2001, 2012, Correia 2014, Dasgupta 2014, and Litland 2017, who express grounding with a sentential connective instead.

³ See Horgan 1982, Petrie 1987, Paull and Sider 1992, McLaughlin 1995, Stalnaker 1996, Sider 1999, Shagrir 2002, Bennett 2004, and Hoffmann and Newen 2007 on local, global and various “intermediate” notions of supervenience and the entailment relations (or lack thereof) among them.

⁴ Cf. Rosen 2010, Audi 2012, Correia 2013, Dasgupta 2014, Fine 2015, and Correia and Skiles 2019 for similar views.