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Grounding Functionalism and Explanatory Unificationism

ABSTRACT: *In this essay, I propose a functionalist theory of grounding (functionalist-grounding). Specifically, I argue that grounding is a second-order phenomenon that is realized by relations that play the noncausal explanatoriness role. I also show that functionalist-grounding can deal with a powerful challenge. Appeals to explanatory unificationism have been made to argue that the success of noncausal explanations does not depend on the existence of grounding relations. Against this, I argue that a systematization involving functionalist-grounding is superior to its anti-relational counterpart.*

KEYWORDS: grounding, grounding functionalism, noncausal explanation, explanatory unificationism

Introduction

Metaphysicians often say that some things hold in virtue of other things. Chairs exist in virtue of certain arrangements of particles. Mental events exist in virtue of neural events. The normative characteristics of a given state of affairs hold (at least partly) in virtue of the nonnormative features of that state. What is particularly striking in these examples is the *in virtue of* claim. How is it supposed to be understood? Clearly, the relevant connection is noncausal: chairs are not *caused* by the appropriate arrangement of particles. To that end, many philosophers have proposed that *in virtue of* should be explicated by appealing to the relation of *grounding*. According to this picture, what these examples have in common is that they are grounding claims.

Metaphysical grounding is generally understood as a worldly, noncausal, determination relation that is tightly linked to explanation (I adopt a relational understanding of grounding per Jonathan Schaffer [2009]). Also, it is typically understood as metaphysically primitive and unanalyzable (Audi 2012). Against this tradition, I defend a reductive, functionalist, account of grounding, which I call *functionalist grounding*, or *f-grounding*. In this sense, a relation *R* is a

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grounding relation iff *R* plays the appropriate functional role. As detailed below, I understand that functional role, minimally, as the function of backing noncausal explanations.

The minimality of this function allows for at least some paradigmatic so-called *small-g* relations to figure as its realizers. Small-g relations are noncausal determination relations that, according to Jessica Wilson, make general (big-G) grounding relations obsolete, arguably because many of the roles grounding is supposed to fulfil are already fulfilled by small-g relations (Wilson 2014). According to my proposal, small-g relations serve as *realizers* of grounding showing that the two kinds of relations are not in competition. Exemplars of such realizers include functional realization, composition, and other noncausal determination relations. For other potential candidates see Karen Bennett (2017). Nonstandard small-g relations might include *social construction* (Ásta 2015), *anchoring* (Epstein 2015; 2019; Schaffer 2019), *machretic determination* (Gillett 2016), or the *governing* relation (Wilsch 2021).

This way of understanding grounding accommodates two important constraints. The first one is what I call (Unity): different instances of grounding should be objectively unified. The second one is (Pluralism): a theory of grounding should be as diverse as possible in terms of formal features. The resulting picture understands potential realizers of grounding as both significantly diverse and importantly unified.

A very important virtue of my proposal is that, in virtue of meeting those two constraints, it can meet a powerful challenge that every theory of grounding must face. According to this challenge, grounding relations do not exist since they are explanatorily obsolete. Under the unificationist framework, as championed by Philip Kitcher (1981; 1989), explanations are understood holistically without appealing to noncausal determination relations like grounding. (I respond to this challenge below.)

Still, I should note that the main objective of this essay is to present an initial *sketch* of the functionalist theory by showing how it deals with an important challenge. But there is more work to be done if a theory of f-grounding is to be fully defended. For example, it needs to be shown how f-grounding interacts with well-known issues in the literature, such as questions concerning the epistemology of grounding, or questions concerning grounding's connection to fundamentality (Leuenberger 2020). In this sense, I take it that every theory of grounding (including f-grounding) needs to be developed in a piecemeal fashion. In this essay, I present an initial gloss and focus on the unificationist challenge thus showing that f-grounding is a theory of grounding that should be taken seriously.

1. Constraints for a Theory of Grounding

Grounding has instances. The singleton set involving Socrates is grounded by Socrates. A given mental state is grounded in its corresponding neural state. If these are genuine cases of grounding, then they must have something substantive in common. Orthodox grounding theorists typically argue that different instances of grounding are unified in terms of a fixed set of formal features. The proponent

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of f-grounding has a different story. F-grounding is realized by paradigmatic small-g relations all of which realize the appropriate functional role. In this sense, even if it turns out that such realizers have no first-order features in common, it would still be the case that they are unified in terms of their functional role.

Both accounts have important challenges to face and require scrutiny. Still, both theories agree that for grounding to be a unified phenomenon, it must be shown in what way its different instances are objectively unified. This provides the first constraint:

> (Unity). Different instances of grounding should be objectively similar to one another.

I say more about the way in which f-grounding meets (Unity) below. However, why is (Unity) important?

First, one uncontroversial objective of realist metaphysics is to group together phenomena that appear qualitatively different but are objectively similar. In this sense, if the realizers of f-grounding are objectively similar then this is, on its own, a substantive result. Moreover, (Unity) has at least one interesting philosophical consequence. F-grounding is a reductive theory of grounding: it analyzes grounding in terms of something more familiar (the family of its realizers). This is epistemically fruitful. If *P* reduces to *Q*, then beliefs about *Q* can act as constraints for one's beliefs about *P* and vice versa. To illustrate, consider ethical reductionism. If the ethical reduces to (say) the pleasurable, then we should expect for some features of the ethical to be revised accordingly (a candidate would, perhaps, be the putative intrinsic motivational force of moral properties).

Analogously, consider a classic problem that arises in the literature: the problem of what grounds grounding-facts (for example, what grounds the fact that *P* grounds *Q*; call this the meta-grounding problem). There are many proposed solutions (Wallner 2018). However, a reductive theory like f-grounding has important implications for the way the problem is framed. First, it would follow that the meta-grounding problem would be the problem of what f-grounds the fact that *P* f-grounds *Q*. If (say) functional realization is understood as a grounding relation, then this allows for the meta-grounding problem to be restated: 'What functionally realizes the fact that certain properties functionally realize higher-order states?'

(Jessica Wilson [2014: 568n80; 2016: 13–16] has argued that the meta-grounding problem is a 'spandrel' problem. Specifically, she argues that the meta-grounding problem does not even arise in the case of small-g relations. I think this move is premature—although not without some merit; see below. It is true that an analogous problem has not appeared in the literature on small-g relations, but this does not necessarily compromise the legitimacy of the question itself, especially if one considers all the different ways the meta-grounding problem can be formulated per David Kovacs [2019].)

Arguably, an answer to this question would appeal to a variety of factors including, perhaps, facts about the nature of functions, and so on. This framing also naturally indicates a plausible *methodology* for approaching the

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meta-grounding problem. If the grounds of f-grounding facts are functional realizers of those facts, then tracing the grounds of grounding-facts would require the identification of the functional role of grounding-facts and which facts actually fulfil that role.

More importantly, an f-grounding construal of the meta-grounding problem entails that there are *many* meta-grounding problems. Each realizer of f-grounding would involve a specific meta-grounding problem for *that* relation (such as one for constitution, one for social construction, and so on). This indicates that it is very likely that an *all-fits-all* solution is not possible. Some instances of the problem might have trivial solutions. Consider strong emergence as a realizer of f-grounding. Strong emergence-facts are typically brute so, in this case, there would be nothing f-grounding the meta-facts. Other instances of the problem are not even coherent. Truth-making is a plausible realizer of f-grounding. But the question of what makes true a truth-making fact does not arise since truth-making facts are not truth-apt. Of course, all of this is controversial, but the point remains: if grounding reduces to something more familiar, then new ways of addressing old problems become available.

Meeting (Unity) is a good thing, but one might worry that this will result in the exclusion of many nonstandard cases of grounding. In this sense, (Unity) pulls in a direction that makes it difficult for an account to be pluralistic. Call this constraint (Pluralism):

(Pluralism). Instances of grounding should be as diverse as possible.

I focus on *formal* diversity. For example, orthodox theories take every instance of grounding to have the same formal features. The most typical account takes grounding to impose a strict partial order on the entities it relates: every instance of grounding should be transitive, reflexive, and asymmetric. Naturally, this way of understanding grounding excludes cases that do not exhibit such features.

Candidates for nonorthodox grounding are numerous and can be easily found in the literature (for an influential defense of this point, see Wilson [2014: 569–70, 572]). Here are some examples. Cases of reflexive grounding are advanced by Jack Woods (2018) (see also Barnes 2018). Failures of transitivity are highlighted by Schaffer (2012). Symmetric cases of grounding are accepted by Daniel Nolan (2018). Less straightforward rejections of asymmetricity involve what we might call mixed cases of grounding (Bennett 2017: 25–29; Litland 2018) (that is, cases where two different grounding relations go in opposite directions). The typical example involves Schaffer's priority monism (2010), where the parts of an entity hold in virtue of the whole, but the whole is composed by its parts (for a similar view with different relata, see Bernstein [2020]). More sophisticated disagreement involves grounding's modal force. Traditionally, instances of grounding are taken to be metaphysically necessary, but others take them to be contingent (Skiles 2015) (for a hybrid view in the context of grounding pluralism see Richardson [2021; see also 2020]). More extreme views highlight grounding cases that are indeterministic (Emery 2019) (see also Bennett 2017: 50–55).

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Building the impossibility of such cases *into* one's definition of grounding is problematic. Many paradigmatic small-g relations exhibit a diverse array of formal features. According to some, realization is nonreflexive (see Shoemaker 2007: 23n17) and nontransitive (Gillett 2016: 221–24). Similarly, others suggest that constitution may be symmetric (see Pereboom 2002: 618).

One might worry that these are *limiting cases*. Limiting cases of (say) realization are cases that are, in a sense, simply a technical by-product of the way the realization relation has been defined. For example, according to Sydney Shoemaker (2007: 10–31) *P* realizes *Q* when *Q* has a subset of the causal powers of *P*. Contra Wilson (2011), Shoemaker does not impose any constraints on parthood which means that, trivially, *P* can realize itself (because *P* can be a part of itself). That said, I find the notion of a limiting case imprecise and obscure. Kovacs (2017: 5–6) attempts to characterize it but admits that it is difficult to spell out in substantive terms. Still, even if there *are* such limiting cases it does not follow that every case of nonstandard small-g case is a limiting case. For example, Carl Gillett's (2016: 221–24) notion of realization *typically* breaks transitivity and does not fall under any plausible characterization of a limiting case.

I assume that these cases generate prima facie good reasons to have a relaxed view about the formal features of grounding. After all, recall that grounding is supposed to figure in the same contexts where many paradigmatic small-g relations appear. To my mind, a theory of grounding that can accommodate this plurality of formal features is better than one that cannot, all things considered. Naturally, (Unity) and (Pluralism) set the bar very high. Attempts to accommodate (Pluralism) make it increasingly more difficult to meet (Unity). The messier the phenomena the more difficult it is for them to be unified. Still, my proposal delivers the right result.

2. Functionalist Grounding

I take grounding to be a second-order phenomenon. More specifically, some relations *realize* the grounding relation by having the right function. Typically, a function is specified via some job description. But making the job description too detailed risks disqualifying many potential realizers, thus violating (Pluralism).

To illustrate, consider functionalism about causation. Peter Menzies (1996) identifies a list of platitudes about causation and then provides a definition that accommodates them. Some of these platitudes include causes preceding their effects and the relata of causation being events. However, as Stathis Psillos (2008: 6) notes, an account based on these platitudes is highly parochial as several conceptually coherent cases of causation are excluded. Similar worries apply to the grounding case. If, for example, the grounding job description says that the relata of grounding are always facts, then that would exclude relations that are cross-categorical (such as the truth-making relation). Specifically, Bradley Rettler (2017: 13–14) falls victim to this sort of charge. Rettler defines grounding in terms of a cluster of roles, one of which is the role of being able to 'relate the fundamental with the less fundamental level' (2017: 6). But bracketing the controversial nature of fundamentality itself, this sort of role would exclude relations that do not track differences in fundamentality (Wilson [2014] famously makes this point).

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There is a way to go forward. Minimizing the set of platitudes as much as possible yields a version of grounding functionalism that meets both constraints at once. A way to do this is to identify only a *single* platitude. I propose that a relation *R* is a grounding relation when *R* has the function to be explanatory in a distinct way. So, the question arises: In what kind of explanation are realizers of f-grounding involved in?

2.1. What Kind of Explanation?

I understand explanatoriness in terms of *backing*. A relation is explanatory when it has the appropriate features to *back*—that is, support—explanations. (Kovacs [2017] takes backing to be, itself, the explanation relation. Ylwa Sjölin Wirling [2020] identifies backing with grounding [see also Kovacs 2019: 6–10]. Elsewhere I identify backing with a minimal version of the truth-making relation [Stamatiadis-Bréhier 2021].)

Grounding theorists typically cash out grounding explanations as *metaphysical* explanations. However, this is unhelpful at best, as there is no consensus about what these explanations are supposed to be. Perhaps metaphysical explanations are essentially *synchronic*. But this is restrictive and controversial: there seems to be room for synchronic causation and diachronic grounding (Baron, Miller, and Tallant 2020). Nor is it illuminating to say that metaphysical explanation is the 'ultimate' form of explanation (Fine 2012: 44).

A more distinctive variety of explanation is *noncausal* explanation. Note that to avoid circularity we cannot define noncausal explanation in terms of grounding (that is, explanation that is backed by grounding). Rather, noncausal explanation can be defined negatively: take the set of every explanation, then identify the ones that are causal, and the remainder is the set of noncausal explanations. This way we have:

> (Functionalist Grounding). A relation *R* is a grounding relation iff *R* has the function to back noncausal explanations.

This is a promising way of understanding grounding explanations for at least two reasons. First, we know what those explanations are. They are defined negatively in terms of explanation simpliciter and causation. Secondly, (Functionalist Grounding) is specific but not too restrictive. On the face of it, no paradigmatic small-g relations are excluded as most of them routinely figure in explanations. Plausible examples include interlevel mechanistic explanation (Craver 2009), truth-making explanation (Asay 2017), or explanations involving various other small-g relations like social construction (Griffith 2017).

2.2. Spelling Out the Account

What about the notion of realization at play in the definition of (Functionalist Grounding)? Thankfully, we do not have to reinvent the wheel. A minimal characterization of functional realization is the following:

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> (R). A property P functionally realizes a property Q if and only if for some role functional R (i) Q is the property of having a property that occupies R, and (ii) P is a property that occupies R. (Baysan 2015: 6)

Numerous more fine-grained definitions of functional realization have been proposed (for example, Wilson 2011) but running my presentation along such lines would needlessly complicate things. Modifying the proposal in relational terms is a matter of simple substitution. Also, note that nothing in (R) requires that the relevant role occupants play *R causally*. This is a good thing, as, typically, most grounding relata occur synchronically (although they do not *have* to under the current proposal).

What about the realizers themselves? One thing to notice is that we will not have a full account of the nature of the relevant realizers until we have a complete theory of noncausal explanation. For example, if one's theory of explanation takes a successful explanation to be one that cites an asymmetric determination relation, then realizers of f-grounding will be those determination relations that are asymmetric. This result might strike someone as clearly objectionable given the restriction it puts on the set of possible realizers. However, I am confident that this is *not* how a final theory of noncausal explanation will look like. As mentioned, many nonstandard cases of grounding are prima facie explanatory. But *even if* explanation turns out to be strictly asymmetric, thus restricting the set of f-grounding realizers appropriately, this would still be a better way of identifying the formal features of grounding rather than relying on abstract intuitions.

(It is also worth noting that under this relaxed view about the formal features of grounding, f-grounding does not have interesting *general* formal features: it is nonsymmetric, non-transitive, and non-reflexive–assuming that most of the nonorthodox cases I mention above are genuine metaphysical possibilities. In contrast to Bennett [2017: 25–29], I take this to be a feature of my view, not a bug—vis-à-vis (Pluralism) and the challenge from explanatory unificationism. Rather, it is a problem for the thesis that grounding, or 'building' according to her ideology, is *general* [Bennett 2017: 22, 28]. But f-grounding *does* have a general modal profile and its realizers are simply instances of it. Also note that this kind of generality is not trivial since it entails interesting philosophical consequences.)

Defining grounding without building a particular account of noncausal explanation into the definition is a feature, not a bug. For one, we do not *need* to have a full theory of noncausal explanation to know that there *are* instances of successful noncausal explanations. And insofar as those explanations involve relations, then there are instances of f-grounding. A non-grounding example might help to illustrate. Some philosophers argue that phenomenal experiences form a natural kind even though we do not know everything there is to be known about them. We have reasons to posit the existence of qualia based on what qualia *do* (they help agents orient themselves, and so on). Knowing everything about *P* is not a necessary condition for knowing that *P* exists.

Analogously, a functional characterization of grounding is insightful even if we do not have full knowledge of all the possible extensions of the term *f-grounding*. Not only do we know that there *are* genuine noncausal explanations backed by relations,

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but we also have many plausible *candidates* that can play this role. Many of those relations, I claim, can be found in the set of what Wilson calls 'small-g' relations. (I say *many* and not *all* because Wilson can be interpreted as claiming that some small-g relations are causal that is, causal composition) [2014: 540]. Consider also Bennett's list of building relations, which explicitly includes causation [2017: 71–83; although see Schaffer 2020].)

Secondly, staying noncommittal towards the ultimate theory of explanation does not compromise the unity of grounding. (Functionalist Grounding) is compatible with the possibility of radical multiple realization. An entity is radically multiply realizable iff it can be realized by entities that have no first-order properties in common. In this sense, it could be that distinct instances of grounding share nothing substantive in common at the first-order level. Or it might turn out that every grounding relation has some set of fixed formal features that are yet to be discovered. Either way, second-order similarity is enough for (Unity) (although see below).

Finally, the debate surrounding the right formal features of explanation is nuanced and ongoing. In this sense, not committing to a particular theory of explanation is the only non-parochial and prudent move at this point. Also, one can be neutral towards the details of the final theory of explanation and still recognize that we have independently good reasons to think that many paradigmatic small-g relations are genuinely explanatory and, hence, genuine realizers of functional-grounding. Relatedly, it need not be the case that *every* noncausal explanation is backed. In this sense, (Functionalist Grounding) stays neutral towards the existence of unbacked noncausal explanations (compare to what D'Alessandro [2020] calls the 'dependence thesis') (I discuss this in greater detail below).

The minimality of (Functionalist Grounding) is worth emphasizing. Consider Schaffer's (2016) influential account, according to which grounding is modeled on the template of structural equation models. Schaffer's proposal is a variant of what Amanda Bryant (2022) has called *grounding interventionism*, akin to causal interventionism (Woodward 2003). The key idea is that, roughly, grounding is understood in terms of interventionist counterfactuals so that P grounds Q if there a possible intervention on P that, if implemented, would change the value of Q. (Functionalist Grounding) is similar to grounding interventionism, at least in spirit, given the idea that grounding is accounted for in terms of what it *does*.

However, (Functionalist Grounding) does not appeal to a notion of intervention, nor to a model involving structural equation models specifically. Rather, the heavy lifting is done by the noncausal explanatoriness functional role. This is a good thing since it allows (Functionalist Grounding) to bypass objections that grounding interventionism typically faces. For example, grounding interventionism has difficulties accounting for the possibility of grounding loops (Schaffer 2016: 62, 69). There are also difficult questions concerning the evaluation of noncausal interventionist counterfactuals since many of them require metaphysically impossible interventions (Wilson 2018). It is a feature of (Functionalist Grounding) that it can avoid taking a stance towards these thorny issues.

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2.3. Worries

Before I move to the next section, I must address three worries. First, someone might object that (Functionalist Grounding) is circular. A relation is a grounding relation iff it can *realize* the noncausal explanatoriness role. But functional realization is also a grounding relation (since it is plausible that functional realization is a realizer of f-grounding). So, the definition of f-grounding is circular.

I have three responses. First, there are ways to account for functional talk without appealing to a realization *relation*. For example, we could say that f-grounding is identical with the disjunction of all of its possible realizers. This move is a variant of the so-called disjunctive move in the philosophy of mind according to which the type of a particular mental state is identified with the disjunction of its possible first-order realizers (Clapp 2001).

If the set of f-grounding realizers is a mere disjunction, then in what sense are they importantly unified? Jaegwon Kim (1992: 13), in a similar context, argues that 'disjunctive properties . . . do not guarantee similarity for instances falling under them'. I agree that it is not *necessary* for a disjunction to have objectively similar instances. But under the current account, similarity is preserved. The unity of f-grounding realizers is secured in virtue of their playing the noncausal explanatoriness role. The key behind the disjunctive characterization concerns, rather, the fact that the functional state at play is *identical* with whichever realizer successfully implements it (for this sort of 'filler' functionalism, see McLaughlin [2006]).

Secondly, even if realization is a grounding relation, it does not follow that the proposed definition is *problematically* circular. This is because realization is plausibly defined *independently* of grounding. For example, per (R) above, realization is defined in terms of second-order properties. It is permissible for realization to appear in the definiens of (Functionalist Grounding) given that we have an independent grasp on the notion of functional realization. This move is similar to the strategy used by Menzies and Huw Price in order to define causation: famously, they define causation in terms of manipulability, and, in turn, manipulability is defined in terms of a notion of 'bringing about' (1993: 194). They argue that this is permissible given that we can define bringing-aboutness independently of causation via an ostensive definition. Of course, one might worry whether this is indeed possible. But whatever the merit of this type of objection, it does not apply to (Functionalist Grounding) since, as mentioned, it is uncontroversial that realization can be defined independently of grounding.

Finally, there is also the option of embracing a non-reductive account of functionalist grounding (I thank an anonymous referee for encouraging me to discuss this move). For one, there is an important precedent of non-reductive accounts in the literature on causation. James Woodward's (2003) influential account famously suggests a conceptual connection between causation and manipulability without trying to define the former in terms of the latter. This route is followed by Schaffer's (2016) account according to which grounding is understood in terms of structural equation models. I am also inclined to agree with Schaffer that nothing metaphysically suspect about the nature of grounding

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would follow from this. If f-grounding is non-reductively accounted for in terms of functional realization, it would not follow that f-grounding is metaphysically brute or anything of the sort (2016: 67). So this strategy is also a promising option for the f-grounding theorist.

The second potential worry concerns (Unity). According to (Functionalist Grounding), relations that back noncausal explanations are realizers of f-grounding. In this sense, plausible candidates of such explanations (such as functional realization, constitution) are unified in terms of the noncausal explanatoriness role. But it could be objected that it needs to be further demonstrated whether such a functional role is robust enough to furnish (Unity). Much of this comes down to the phenomenon of noncausal explanation and whether it can be considered as a unified phenomenon.

A full defense of the unity of noncausal explanatoriness is beyond the scope of this essay. As mentioned, a complete defense of (Functionalist Grounding) must proceed in a piecemeal fashion, and in this essay I focus on the challenge from explanatory unificationism. Still, there are reasons to be optimistic. For one, noncausal explanatoriness is a well-defined phenomenon that has attracted a lot of attention in the literature (see Reutlinger and Saatsi 2017). Relatedly, even on a minimal characterization, the set of noncausal explanations can plausibly be understood as a natural kind. According to Richard Boyd's (1999) influential accommodationist framework, a collection of entities counts as a natural kind insofar as these entities exist, and they satisfy our disciplinary demands. And I take it that there *is* a demand for a distinct category of such explanations. In this sense, the relations (that is, realizers of f-grounding) that are involved in such a philosophically interesting phenomenon are prima facie unified.

Finally, difficulties might arise concerning explanations that involve a mixture of causal and noncausal components. Consider Alastair Wilson's (2018: 23) 'mixed' causal models according to which some chains of dependencies comprise of both causal and noncausal ('grounding') links. For example, the fact that the batsman is out of a given game of cricket is explained partly in terms of the way the ball was delivered, and partly in virtue of the fact that cricket rules noncausally make it the case that a batsman is out under such-and-such conditions (Wilson 2018: 23). But f-grounding realizers back noncausal explanations that, by definition, are not underwritten by causal relations. So what should the f-grounding theorist say about partially causal explanations?

One way to deal with such cases would be to amend (Functionalist Grounding) so that a relation is a realizer of f-grounding insofar as it backs any explanation that has a noncausal component (I thank an anonymous referee for the suggestion). But there is a way to deliver the same result without amending our working definition. It is plausible that mixed explanations of the above form can be broken down into their causal and noncausal components (for similar examples see Marc Lange's 'hybrid' explanations [2018: 1345]). In this sense, a realizer of f-grounding backs a mixed explanation *derivatively* by backing the noncausal explanation that it comprises. The remaining causal explanation is backed, per usual, by a causal relation. So, mixed explanations pose no particular threat to (Functionalist Grounding).

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3. Grounding and Explanatory Unificationism

(Functionalist Grounding) establishes a link between explanation and grounding. Kovacs (2017: 2943–46; 2020: 1) and Sam Baron and James Norton (2020: 3) appeal to explanatory unificationism to argue against this. According to unificationism, explanations are certain kinds of arguments. The relevant explanantia are found in the premises and the explanandum is found in the conclusion. According to Kitcher's influential account, explanations are arguments that figure in a maximally unified set. Roughly, for something to be a genuine explanation it must be the case that a candidate systematization, in virtue of including that explanation, generates the largest possible set of *conclusions* using the *smallest* number of *patterns* (which must be as *stringent* as possible).

At this point, it is useful to consider some parts of Kitcher's ideology. Kitcher's account is very developed and complicated, and although I present those pieces of Kitcher's ideology that are necessary for the relevant argument to be understood, it is worth noting that, at this point, what is important is the *core* idea behind unificationism, not its accompanying ideology. Kitcher specifically mentions that the logical notions he employs could be replaced with more sophisticated machinery (Kitcher 1989: 501n18).

A pattern is a set with three components: a *schematic argument* (a sequence of schematic sentences—that is, expressions where, typically, some of the nonlogical symbols are replaced with dummy letters); a set of *filling instructions* (directions for replacing dummy letters); and a *classification* (a descriptions of the inferential characteristics of the schematic argument) (Kitcher 1989: 432–33). Finally, the more stringent an argument pattern is, the more difficult it is to be instantiated. For illustration purposes, consider a candidate systematization E and the following derivation (1989: 432, modified):

> (Test)
> (1) It is the case that a specific organism x_1 is homozygous for the sickling allele, iff, it is the case that x_1 develops anemia.
> (2) It is the case that x_1 is homozygous for the sickling allele.
> (C) So, it is the case that x_1 will develop anemia.

(Test), considered in isolation, does not significantly contribute towards the unifying power of E for it only concerns one entity (x_1). Still, (Test) is plausibly subsumed by the following pattern:

> (Test*)
> (1′) It is the case that an organism x is homozygous for the sickling allele, iff, it is the case that x develops anemia.
> (2) Organism x_1 is homozygous for the sickling allele.
> (C) So, organism x_1 will develop anemia.

(Test) instantiates the general argument pattern (Test*) which, in turn, *is* an important contribution towards the unifying power of E. (Test*) can generate

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many different conclusions (for all kinds of different organisms) and is highly stringent (not any kind of state of affairs can instantiate its components).

Analogously, for f-grounding to exist, an explanation involving f-grounding should appear in the maximally unifying systematization. The unificationist argues that we have good reasons to believe that it does not. Consider a derivation involving functional realization:

(Realization)
(1) Brain state type P *functionally realizes* mental state type Q.
(2) P_1 holds.
(C) So, Q_1 holds.

The natural move for the f-grounding theorist is to say that (Realization) is an instance of a more general pattern:

(F-grounding)
(1′) Type P *f-grounds* type Q.
(2) P_1 holds.
(C) So, Q_1 holds.

Does (Realization) instantiate (F-grounding)? It seems that it does. (1) is an instance of (1′), assuming functional realization is a realizer of f-grounding (similar remarks apply to patterns involving other paradigmatic small-g relations) (see Kitcher 1989: 432–33).

(Note that (F-grounding) is logically invalid unless we modify the relevant inference rule involved in the classification. Specifically, it would have to be admitted that every case of f-grounding is itself an instance of an entailment involving the same relata—that is, if *P* f-grounds *Q*, then *P* entails *Q*. But then (F-grounding) is committed to some form of grounding necessitarianism. On the face of it, this is a problem. It would be nice to be able to countenance cases of contingent or indeterministic f-grounding per (Pluralism). Thankfully, there is a way to do this under the unificationist framework if one allows for non-deductive arguments to figure in the best systematization. In fact, many happily make this amendment [see Kitcher 1981: 519; Schweder 2005: 433] as it does not compromise the key motivation behind unificationism. I thank an anonymous referee for pressing me on this.)

So now the question is whether (F-grounding) figures in the maximally unifying systematization. This is where the unificationist challenge comes into play. The unificationist argues that, regardless of its merits, (F-grounding) should be replaced with a simpler pattern:

(Simple)
(1) P, iff, Q.
(2) P_1 holds.
(C) So, Q_1 holds.

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(Simple) dispenses with the f-grounding operator and replaces it with a simple biconditional (per the default view in the literature (see Dretske 1977; Friend 2016)). Simply put, a systematization with (Simple) will be more unified than a systematization with both (Simple) and (F-grounding). Other things being equal, the systematization with the lowest number of patterns is the more unifying one. If this is the case, then f-grounding is not compatible with explanatory unificationism. Noncausal explanations would not be backed by grounding-like facts. Rather, if *P* explains *Q*, then *P merely entails Q* (where the relevant entailment-claim is not backed by a grounding relation).

There are many ways in which the f-grounding theorist can respond to this challenge. Perhaps a promising strategy would be to deny explanatory unificationism altogether. After all, the unificationist must assume the truth of unificationism in order to advance her argument. But is it true that unificationism is independently motivated as a theory of explanation? Many philosophers disagree. For example, many argue that determination-based theories have emerged victorious (de Regt 2006). Similarly, others argue that unificationism and determination-based views (whether causation or grounding-based) are compatible: unificationist explanations operate at a higher level of generality than grounding-based ones, but there is no reason to believe that these explanations are incompatible with one another (Railton 1978: 208; Kim 1994: 69; de Regt 2006). It is uncontroversial that higher and lower-level explanations can (at least sometimes) complement each other. Why assume that unificationism excludes other forms of explanation?

Perhaps unificationism should not be understood in global terms but as concerning a particular subset of explanations. Still, I think the f-grounding theorist can do better. My strategy is therefore to argue that, even by the unificationist's own lights, at least some arguments must by backed by f-grounding relations, thus showing that (Functionalist Grounding) is compatible with explanatory unificationism. The resulting picture would be that the arguments appearing in the best systematization of the phenomena are backed by realizers of f-grounding.

Showing this is particularly important for dialectical reasons. One of the motivations behind Kitcher's (1989) original unificationist framework was *precisely* to argue for an antirealist theory of causation. For Kitcher, causal relations between phenomena are simply reflections of our inferential practices (1989: 436–37). Specifically, Kitcher takes unificationism to involve a 'top-down approach' to explanation (1989: 439), according to which worldly items (such as causation and grounding) are accounted for in terms of explanation rather than the converse (for an application of this strategy to grounding, see Kovacs [2021]).

It could be objected that unificationism should be detached for the top-down approach to explanation. Still, even though I am sympathetic to this, I think it is philosophically fruitful for this claim to be *demonstrated*. Also, the idea that unificationism goes hand in hand with something like the top-down approach is relevantly widespread in the literature (for example, Woodward and Ross 2021: section 5.2.; Craver 2019: 528–29; Brenner et al. 2021: section 6.3.). The idea that explanation is a primary guide for the existence of grounding is also prevalent

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in the literature. For example, Kovacs (2017) presents unificationism against the backdrop of the argument from explanatoriness for the existence of grounding. According to this argument, grounding exists because only by appealing to grounding we can make sense of noncausal explanations. It is held that this is one of the most powerful arguments for the existence of grounding (see Audi 2012: 102). So, an argument that compromises the connection between grounding and explanation lands a very powerful blow to the existence of grounding. For these reasons, dealing with the unificationist challenge on its own terms is particularly important.

3.1. The Supplementation Strategy

My first attempt at introducing f-grounding tried to *add* an argument pattern in the relevant systematization (specifically in what Kitcher calls the 'generating' set, that is, the set that includes every argument pattern) (1981: 519–20; 1989: 434). The main challenge concerned the size of the systematization. A systematization with (Simple) has fewer argument patterns than a systematization with (Simple) *and* (F-grounding). Still, there are reasons to be optimistic about this strategy.

For one, (F-grounding) is highly stringent. It is more difficult for a derivation to instantiate (F-grounding) than (Simple). This is obvious considering (F-grounding) has one extra term than (Simple): the f-grounding operator. To illustrate, consider a case where P and Q modally covary without there being an intimate connection between them. A derivation involving this metaphysical scenario would instantiate (Simple) without instantiating (F-grounding). On the contrary, a derivation involving the relation of (say) constitution would instantiate both argument patterns.

Secondly, consider a desideratum for unification that is usually omitted from the relevant discussion: the set of beliefs that a given systematization involves is supposed to include beliefs that are in some *default* state. This is what Kitcher calls the *explanatory store*; this store includes a 'reserve' of beliefs and arguments that 'we may tap as need arises' (1981: 512, 519). Typically, this explanatory store includes scientific beliefs but for my purposes I assume that it also involves beliefs about metaphysics. For example, there is a significant and developing literature on the nature of constitution. Constitution theorists disagree about its features and try to deal will classic puzzles involving, say, coincident entities. In their domain, the existence of constitution is assumed. In this sense, a systematization that accommodates many (say) constitution-beliefs is superior to its revisionist counterpart, other things being equal.

Finally, a systematization that includes (F-grounding) has a straightforward way of dealing with a notorious problem that unificationist theories typically face: the problem of asymmetry. The typical example involves the explanation of the length of a flagpole's shadow in terms of the flagpole's height, the fact that there is a sun, and certain ancillary conditions involving the relevant laws of nature. Because laws typically have a biconditional form, it seems that one can derive the relevant law of nature from the flagpole's shadow and vice versa (Bromberger 1966). But this does not seem right. The correct result involves deriving the flagpole's shadow from the relevant law of nature and other ancillary assumptions, not the other way around.

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The problem generalizes to noncausal explanations. Consider the explanation of a mental state in virtue of its corresponding brain state and the relevant psychophysical law. Similarly, due to the biconditional nature of the relevant law, it seems that we can derive (and, thus, *explain*) one's brain state partly in virtue of one's corresponding mental state.

Unificationists are aware of the problem. Typically, they argue that the intuitively correct derivation is also the one that importantly contributes to the unification of the relevant systematization (Kitcher 1981: 522–26; 1989: 436, 482–88; Kovacs 2020; Baron and Norton 2020: 197–206). Still, the f-grounding theorist can simply appeal to an asymmetric realizer of f-grounding to break the symmetry. In this sense, the relevant psychophysical law-statement would be backed an f-grounding relation that would fix the order of determination. In the current example, the law would specify that, necessarily, mental states are functionally realized by brain states (but not vice versa).

Compared to the typical unificationist response, this is a preferable strategy for at least two reasons. The first reason is epistemological. For the unificationist the putative unifying power of argument patterns is judged holistically. This means that we will not be able to *tell* whether a given argument pattern is genuinely unifying *unless* we also have a sufficiently large portion of the relevant optimal systematization. To compare, a response that can appeal to an f-grounding relation is straightforward. In the example at hand, we have independently plausible *empirical* reasons to think that the order of determination runs from the neural level towards the mental level. (I have in mind certain counterfactual tests that are routinely used in the special sciences [Woodward 2003]. For a similar solution to the asymmetry problem (that appeals to a notion of nomic determination) see Wilsch [2016: 4, 15–16]. For a response in the context of unificationism, see Strevens [2004] and Bangu [2017: 11, 16].)

Secondly, (F-grounding) provides fine-grained information about the underlying connection between the relevant entities. This point becomes clearer once we understand f-grounding relations as the noncausal analogues of causal mechanisms. Causal mechanisms make ordinary causal relations more precise by providing fine-grained details about the way the causal connection runs. For example, instead of saying *the fact that I didn't water the plants caused them to wither*, we can supply a detailed story taking as a set-up position an event that does not include my intention to water the plants and the event of their withering as a termination condition (Machamer, Darden, and Craver 2000). Kelly Trogdon (2018) argues that grounding relations have a similar function to mechanisms: they can specify the relevant determination relation (although, in the grounding case, the relata are not causes and effects). For example, instead of saying that a given brain state grounds its corresponding mental state, we can say that the former *functionally realizes* the latter. The latter story is explanatorily richer than the former (Wilson 2014: 541–54).

It could be objected that even if we grant that mental states (M) are (say) functionally realized by brain states (B), given the relaxed view I adopted concerning the formal features of grounding (discussed above), it might turn out that there is another realizer of f-grounding that runs toward the opposite

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direction (that is, from *M* toward *B*). This is definitely possible. But I do not take this to be a serious problem. If *M* somehow noncausally determines *B* (which is doubtful in itself), that would simply indicate that there is another noncausal explanation to be backed alongside the initial one (the one running from *B* to *M*). That would be a nonstandard scenario, and it is a feature of the f-grounding framework that it can accommodate such cases. Perhaps the worry concerns the possibility of explanatory circularity. If *M* f-grounds *B*, and *B* f-grounds *M*, then *M* grounds itself. Again, I do not think this is a serious worry. It is independently plausible that explanations can chain in this way only if certain constraints are met (for example, if the relevant contrast classes align properly).

Even with all these benefits, the supplementation strategy still countenances an extra argument pattern in addition to (Simple). So, on the one hand we have a systematization (call it S) that involves (Simple), and on the other we have a systematization (call it S*) that involves (F-grounding) in addition to (Simple). S wins in terms of having fewer argument patterns whereas S* is superior in terms of stringency, dealing with the asymmetry problem, and being less revisionist towards the explanatory store. Trying to compare S and S* in terms of their overall unifying power is a very difficult task. Kitcher (1989: 433, 435, 481) admits that it is not clear how the relevant desiderata are supposed to compete with one another. Even though I think that the supplementation strategy is highly promising, I will sketch an additional strategy in the next section.

3.2. The Substitution Strategy

Consider the possibility of *substituting* (Simple) with (F-Grounding). For this to work, it would require for *every* noncausal explanation to be backed. This is, of course, a controversial claim and for this reason this strategy cannot be *conclusively* evaluated in the context of this paper. Consider a toy conceptual explanation proposed by Robert Smithson (2020): the fact that x is a vixen holds because of the fact that x is a female fox. This explanation, if successful, could be backed by some sort of *bare* grounding relation (as discussed, but not endorsed, by Trogdon [2018: 1304]), or a distinctive relation of conceptual grounding per Poggiolesi and Genco (2021). Or it could be the case that there is no such heavyweight relation underlying the fact that x is a female fox and the fact that x is a vixen. Similarly with mathematical explanations like explanations involving proofs per Lange (2019). It could be that there is a heavyweight backing relation in the form of what Christopher Pincock (2014) calls *abstract dependence*. Or, again, it could be that such explanations are unbacked.

In this sense, evaluating the success of the substitution strategy largely rests on the outcomes of these debates (Roski 2021: 14125–26). Still, I offer another way of delivering the substitution strategy that is particularly fitting for an account like (Functionalist Grounding). Specifically, it could be that *even in the absence* of heavyweight relations, the explanations mentioned in the previous paragraphs could be backed by *lightweight* relations instead (or combinations thereof).

Examples of such relations may vary. Michaela McSweeney (2020), from whom I borrow the heavyweight/lightweight distinction, appeals to what she calls *meaning/*

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truth determination to account for conceptual/semantic explanations. Sam Baron, Mark Colyvan, and David Ripley (2017) attempt to accommodate mathematical explanations by appealing to a story involving homomorphisms (for objections see Knowles [2020: 9–13]). Finally, cases of explanations involving logical facts (for example, the infamous Socrates singleton set being grounded by Socrates) could be backed by what Brenner et al. (2021: sec. 6.1.) call conceptual/logical mechanisms—that is, 'mechanisms involving the conceptual and/or logical analogue of the grounding determination relations' (for an application of this strategy involving set-necessitation and set-membership see Kovacs [2017: 19n19]).

It could be objected that these relations are not *grounding* relations since they arguably do not exhibit paradigmatic grounding features like factivity and being worldly (McSweeney 2020: 9–10). But they are still grounding relations under (Functionalist Grounding) since they back explanations that are, ex hypothesis, successful. Relatedly, it could be stressed that the very notion of an unbacked explanation is suspect: how could it be that an explanation is successful without being underwritten by *something*? (for a similar point see Stamatiadis-Bréhier [2021: 373]). In this sense, given that such explanations *are* backed by some relations, and given their presupposed success, it follows that the relevant backers are realizers of f-grounding. So, even in the absence of heavyweight relations, it could still be the case that the substitution strategy is successful, thus making it a promising strategy against the unificationist challenge. (Another option would be to deny that such unbacked explanations are even genuine explanations in the first place. Or it could be that they are causal explanations in disguise as suggested by Skow [2014]. But these options seem more controversial than the lightweight approach).

To take stock. On the one hand, there is S, which includes (Simple), and on the other there is S*, which includes (F-grounding) *having replaced* (Simple). Even if we assume that S and S* have the same number of argument patterns and generate the same number of conclusions, it is still the case that moving from S to S* constitutes the pareto optimal move. So it is plausible that (F-grounding) appears in the best systematization of the phenomena, which means that the existence of f-grounding is compatible with explanatory unificationism.

4. Conclusion

F-grounding is a theory that deserves serious consideration. It meets two important constraints that pull in opposite directions: (Unity) and (Pluralism). F-grounding is functionally realized by determination relations that fulfill the noncausal explanatoriness role. Exemplars of such realizers are usually dubbed *small-g relations* in the relevant literature and include relations such as composition, constitution, and functional realization.

Secondly, (Functionalist Grounding), in virtue of meeting (Pluralism) and (Unity), can meet a powerful objection that threatens every theory of grounding: the objection from explanatory unificationism. According to this worry, the realizer set of f-grounding is empty because noncausal explanations are successful without being backed by some determination relation. However, under two plausible

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strategies, even by the unificationist's own lights, an argument pattern involving f-grounding is more unifying than its anti-relational counterpart. Two strategies serve to support this: a strategy involving the supplementation of the relevant systematization with an f-grounding pattern, and a strategy entailing that, at the very least, every noncausal explanation is backed by some lightweight relation. This suggests that explanatory unificationism is not inherently incompatible with the adoption of grounding relations. In fact, as demonstrated, a proponent of explanatory unificationism should be a grounding theorist—albeit of a particular sort.

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