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The grounding-causation disanalogy: a critical look at causation as a guide to grounding

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Abstract De senaste åren har begreppet »grundande« väckt allt större intresse hos metafysiker. Grundande är tänkt att vara en separat typ av metafysisk bestämning. Γ sägs grunda γ när γ existerar eller är på ett visst sätt »i kraft av« eller »på grund av« Γ . Begreppet är användbart inom många filosofiska områden; inom metafysik kan det hjälpa oss att förstå och beskriva verklighetens struktur. Somliga ämnar klargöra begreppet grundande genom en analogi med det mer välkända begreppet kausalitet. En växande grupp filosofer argumenterar för att grundande är *som* kausalitet. Analogin är dock omstridd och, som det visar sig, begreppet grundande är kontroversiellt. I denna artikel argumenterar jag för att analogin mellan grundande och kausalitet slätar över viktiga skillnader och undergräver därmed vår förståelse för de problem som grundande respektive kausalitet har var för sig.

Keywords Grounding · Causation · Structural equations · Fundamentality

1. Introduction

Many substantive philosophical inquiries are about what depends on what. »Metaphysical ground« is supposed to be a distinctive metaphysical kind of determination. One thing is said to ground another when the first in some way accounts for the existence or properties of the second. Less

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fundamental things are grounded in more fundamental things (Bliss & Trogon 2016). Thus, once we have the notion of ground, we find it involved in many of philosophy's big questions; in aesthetics, epistemology, ethics, language² and—which is the topic for this essay—in metaphysics; where the notion of ground might help us describe and explain the structure of reality.

Some philosophers aim to illuminate the notion of ground by an analogy to the more familiar notion of causation. A growing number of philosophers argue that grounding is *like* causation, that they are two distinct species of the same kind of relation (*cf.* Fine 2012; Schaffer 2016; Wilson 2018). Indeed, the two notions have features in common: both are determination relations, both are apt to back explanation, consequently, they share logical and structural features. One proponent of this idea, Jonathan Schaffer (2016), argues that both grounding and causation are best approached through a single formalism that is utilised by »structural equation models«. Others go further: Alastair Wilson claims that grounding is a type of causation: »metaphysical causation« (2018, p. 723).

However, there seem to be important *dissimilarities* between grounding and causation. In the first section, I discuss the attempt to transfer the »structural equation model« from causation over to grounding. The model does not seem to transfer as smoothly as proponents of the analogy will have us believe. Kathrin Koslicki (2016) points out problems in the application of the model to cases of grounding. These arguments weaken the attempt to establish an analogy between the two notions.

In the second section, I discuss vital logical and structural differences between grounding and causation. Following Sara Bernstein (2016), I elucidate two of the most detrimental arguments for those in favour of the analogy. First, the fact that causation is diachronic, while grounding is synchronic. That is, causation happens across time while grounding happens at the same time. Whether causes always precede their effect is a *bona fide* metaphysical question; conversely, it is not a *bona fide* question whether grounders are metaphysically prior to what they ground: they must be. In this vein, the second argument is the fact that causation can be indeterministic, while grounding is deterministic. Chancy causation links causes and effects through probabilities. This has no parallel to any case of grounding; instead, sufficient grounds for a certain entity always raise the probability of that entity's occurrence to 1. These characteristics could prove serious enough to undermine the work the analogy does.

² For instance, in aesthetics: whether beauty is grounded in an entity's physical features, in epistemology: whether the truth of $\langle\phi \wedge \lambda\rangle$ depends on the truth of $\langle\phi\rangle$ and of $\langle\lambda\rangle$, in ethics: whether an action's consequences *ground* its rightness, and in language: whether what a speaker means in uttering a sentence *grounds* its meaning.

1.1 Grounding: the ascent of a notion

The concept of grounding plays a central role in metaphysical inquiry. If we ask *how* an entity exists, a relevant answer can focus on how the entity is generated from what is fundamental. To produce such an answer one needs to know what is fundamental and how fundamentalia ground the rest. As Schaffer (2009, p. 379) concludes: »[M]etaphysics [...] is about what grounds what. It is about the structure of the world. It is about what is fundamental, and what derives from it.«

The concept of grounding is not new; its roots trace back to, at least, Democritus and early greek natural philosophy. *Atomism*, ultimately, describes a grounding relation: fundamentally there are just atoms in the void, but there are also composite objects which are grounded in their fundamental atomic parts (see Berryman 2016; Lucretius 2018). Grounding can be found in the work of both Plato and Aristotle. Plato sets out to answer the following question in *Euthyphro*: »Is the pious (τὸ ὅσιον) loved by the gods because it is pious, or is it pious because it is loved by the gods?« (10a) This can be read as a question of ground: namely, what grounds what? The concept returns in *The Republic*, in »the allegory of the cave«, where the form of the good grounds all other forms: »the objects of knowledge not only receive from the presence of the good their being known, but their very existence and essence is derived to them from it [...]« (509b6-7) This may also be read as a description of a certain form of generation: grounding (see Plato 2003; 2008). Two examples can be found in Aristotle's overall views, expressed in both *The Categories* and *Metaphysics*. The first is the classical example of priority in nature; the *dependence* of truth on being. Consider Aristotle and the proposition ⟨Aristotle exist⟩. By existing, Aristotle makes the proposition true. Conversely, it is not the case that the proposition—by being true—is making Aristotle exist. The second case to be featured in *The Categories* is Aristotle's theory that qualities (ποιόν) *depend* on the substance (οὐσία) they qualify (see Aristotle 2014; 2017; Cohen 2018). It is not until the last couple of years, however, that the notion of ground has raised considerable interest among metaphysicians. Indeed, we now have a burgeoning literature on it.

In contemporary literature, most grounding theorists agree that grounding appears to be a primitive relation (Fine 2001; Rodriguez-Pereyra 2005; Rosen 2010; Schaffer 2009, et al.), thus indefinable. Nonetheless, grounding seems to have certain formal properties: it is a hierarchical dependence-relation, objective and mind-independently partial ordering relation—asymmetric, irreflexive and transitive—between what is less and what is more fundamental, suitable to back a certain kind of explanation. Though, none of these characteristics has gone unquestioned.

The nebulous nature of the notion has given rise to a more serious scepticism about

grounding. While some philosophers deny that grounding is a distinctive notion apart from other making-up relations (e.g. supervenience and constitution) others deny that grounding exists (*cf.* Koslicki 2015; Wilson 2014). For the sake of my argument I assume there is such a thing as grounding, and do a charitable reading of those advocating the analogy, who's understanding of grounding corresponds with the description above. The sceptical debate does, however, have an impact on my thesis, thus I briefly discuss it at the end of this paper.

1.2 The grounding-causation analogy

When confronted with a non-established phenomenon, one way to understand it is to illuminate it by appealing to some other more familiar phenomenon. Grounding is often said to be like causation. Clearly, there are similarities. Both notions seem to be relations of »generation«: grounders »generate« their groundees; causes »generates« their effect. Both seem to be asymmetric, irreflexive and transitive relations: grounding is transitive insofar λ grounding φ and φ grounding ζ guarantees that λ grounds ζ ; causation because if c_1 causes c_2 and c_2 causes c_3 , c_1 is considered to be a cause of c_3 . Grounding is asymmetric insofar as if λ is grounded in φ , φ isn't grounded in λ ; causation because causes cause their effect but not vice versa. Grounding is irreflexive insofar as things cannot ground themselves; causation because nothing can cause itself. Both seem closely linked to, or back, explanation: being involved in »in virtue of« and »because« structures. This makes both grounding and causation part of a small group of dependence relations with this power (Schaffer 2016). Consequently, the analogy has a further implication, as Fine (2012) proposes: one way in which »metaphysical explanations«³ could be understood is as somehow analogous with causal explanations. If causation and grounding are the same kinds of relation, metaphysical- and causal explanation track the same kinds of underlying relation.

The benefit of regarding grounding as, or like causation, is mainly the theoretical unity that ensues. We do not need a separate theory for grounding, instead one may invoke grounding in a theory apt for causation (Wilson 2018). There are (at least) two distinct interpretations or uses for the analogy. One use is for the methodological process of better understanding the notion ground; to illuminate ground by appealing to similar features of causation. A stronger interpretation is to argue that causation and grounding share important features because they are only nominally distinct relations, i.e., two species of the same kind of relation. Schaffer's (2016) view is that grounding and

³ A »metaphysical explanation« connects explanans and explanandum through some sort of non-causal determination. It takes one from what is less to what is more fundamental, rather than explaining an effect with reference to its cause.

causation are two distinct species of one kind of relation: »directed determined relation«. While Wilson's (2018) view is that grounding (what he calls »metaphysical causation«) and nomological causation are two distinct species of one kind of relation: »causation«.

I target both of these theses in this paper, arguing that good arguments are saying the differences that surface when one cross-examines the two notions actually create more difficulties than proponents of the analogy realise. These arguments prove troublesome for the view that grounding and causation are only nominally distinct relations, as well as the view that grounding is a type of causation.

2. The model

If grounding is, or is like, causation, both notions should prove possible to enfold within a single precise formalism. Indeed, this approach has been advocated by both Schaffer (2016) and Wilson (2018), arguing that since the two notions are analogous they are best approached through »structural equation models«. ⁴ The choice of formalism is motivated by the depth of the analogy between causation and grounding. In this section, I argue that the benefit of the structural equation model cannot be realised, due to key differences between causation and grounding. Consequently, weakening the case for the analogy.

2.1 Structural equation models for causation

The structural equation model is characterised by using a structure of (1) independent and dependent variables, (2) a set of incompatible values representing contrast and a set of structural equations, (3) some assignment of values to each independent variable. Firstly, I introduce the formal details of the structural equation model for causation as formulated by Schaffer (2016), before showing how Schaffer and Wilson (2018) modify the notions to apply the framework to cases of grounding.

It's a tripartite structure beginning with (1) a representation of *the system under study*. One selects distinct variables representing distinct features of the world. The variables are situated in a space of incompatible values representing contrasts. One introduces the signature, understood as triple $\mathbf{S} = \langle \mathbf{U}, \mathbf{V}, \mathbf{R} \rangle$. Where \mathbf{U} is a finite set of »exogenous« variables, representing the *independent*

⁴ Both Schaffer (2016) and Wilson (2018) use a structure introduced by Halpern (2000).

conditions, V is a finite set of »endogenous« variables, representing the *dependent* conditions and R is a function mapping every variable $X \in U \cup V$ to an at-least-two-membered set of assigned values. Put simply: $SI = \langle UI = \{Cause\}, VI = \{Effect\}, RI \rangle$

For example: for the situation where a coffee cup is being dropped to the floor and shatters the formalism could be as follows; $SI = \langle UI = \{Drop\}, VI = \{Shatter\}, RI \rangle$. Where UI contains the variable, *Drop*, which represents the coffee cup being dropped to the floor (as contrasting with the cup's not being dropped to the floor); VI contains the variable, *Shatter*, which represents the cup's shattering (as contrasting with the cup's not shattering); RI maps *Drop* to 1 in the event of the cup's being dropped to the floor occurs; to 0 otherwise. Likewise, RI maps *Shatter* to 1 in the event of the cup's shattering occurs; to 0 otherwise.

(2) Next, one adds in *the dynamics*. One codifies functions to show how every endogenous variable is to be evaluated, based on the values of other variables. One introduces the linkage, a pair $L = \langle S, E \rangle$ where S is a signature as characterised in step (1) and E is a set of structural equations. For every endogenous variable $V \in V$, E must contain an equation $E \in E$ such that E outputs a value v to V based on the values assigned to certain other valuables—which thus counts as V 's parents. To preclude loops, E is subject to an acyclicity constraint: no variable can stand in the ancestral of the parenthood relation to itself.

In the case of the coffee cup being dropped on the floor, SI (as described above), a natural linkage is $LI = \langle SI, EI \rangle$, where EI is $\{Shatter \leftarrow Drop\}$ (outputting a 0 for *Shatter* given a 0 for *Drop*, and a 1 for *Shatter* given a 1 for *Drop*).

(3) Finally, one needs to say *what de facto happened*. This is done by setting a function stating how each exogenous variable is to be evaluated. One adds in the assignment, a pair $M = \langle L, A \rangle$ where L is a linkage as characterised in step (2) and A is the smallest function mapping every exogenous variable $U \in U$ to exactly one value.

In the case of the coffee cup being dropped on the floor, SI (as described above), one needs to say whether the cup was dropped or not; by adding $MI = \langle LI, AI \rangle$, where AI is the smallest function mapping *Drop* to 1: $\{\langle Drop, 1 \rangle\}$. Thus a simple structural model for a coffee cup being dropped on the floor would be:

$$SI = \langle \{Drop\}, \{Shatter\}, RI \rangle \text{ where } RI \text{ maps both } Drop \text{ and } Shatter \text{ to } \{0, 1\}$$

$$LI = \langle SI, \{Shatter \leftarrow Drop\} \rangle$$

$$MI = \langle LI, \{\langle Drop, 1 \rangle\} \rangle$$

By drawing each variable as a vertex, and for every case of parenthood draw a directed edge from parent to child, the structural equation model gives us a useful graphic visualisation.⁵ For situation *SI* it would simply be:

Drop → *Shatter*

2.1.1 Modifications

Despite sometimes being referred to as »causal modelling«, the formalism has nothing inherently causal in neither the formal details nor the core ideas the model mesh. Schaffer (2016) thus argues that the structural equation model is suitable for modelling *directed dependency relations* generally; thus equally suitable for modelling both causal and metaphysical dependences, e.g. grounding. Consequently, the formalism needs no adjustment to apply to cases of grounding. What requires adjustment, however, is some of the background understanding of surrounding notions (Schaffer 2016). These can be summarised in the following three modifications: (1) By replacing the »distinctness«-requirement with a weaker »non-identity«-requirement. In the case of causation, the requirement says that the values assigned to distinct variables must all correspond to distinct events; where »distinctness« is meant to rule out both numerical identity and mereological overlap between events. In the case of grounding this requirement says only that the values of distinct variables correspond to »non-identical« entities in the system. »Non-identical« is a weaker condition than »distinct«. The later, Schaffer proposes (2016, p. 76), is to be understood as *neither* identical nor connected by grounding (neither grounds the other, nor do they have a common ground). Summarised by Koslicki (2016, p. 15): »an entity, x, and an entity, y, are *distinct* if and only if (i) x and y are numerically distinct; and (ii) x and y are not »connected by grounding«, i.e. it is not the case that (a) x grounds y or (b) y grounds x or (c) x and y have a common ground.« If the grounding connection (ii) holds, entities can be »non-identical« without being »distinct«. Clearly, the »distinctness«-requirement is not an appropriate operative in the grounding case. For instance, consider the case of grounding where ⟨an armchair which is pink because fuchsia⟩, with the two variables (*Fuchsia* and *Pink*) reserved for ⟨the state of affairs consisting in the armchair's being fuchsia⟩ and ⟨the state of affairs consisting in the armchair's being pink⟩. These variables do not satisfy the definition of »distinctness« just offered since they are connected by grounding; they also

⁵ Schaffer simplifies his presentation by only considering models with (a) finitely many variables, and (b) by assuming determinism (Schaffer 2016, p. 61).

overlap mereologically since they both have the armchair as a constituent. (2) By replacing »events« with »entities«. The standard view on causation is that it's a relation whose relata are events; an idea that is seemingly reflected in the structural equation model. This is not the case for grounding: it is disputed what the relata of grounding are. By using the broad notion of »entities« in the case of grounding the model remains neutral to the exact nature of the relata. (3) By replacing »initial conditions« with »fundamental conditions«, i.e. the »exogenous« and the »endogenous« variables. This modification reflects the two notions' different relationship with fundamentality, to which grounding is closely related whereas causation is not.

2.2 Structural equation models for grounding

The structural equation model for grounding, as for causation, is a tripartite structure; thus, one may proceed by (1) representing the system under study with mathematical variables. The models come with a distinction between the most independent conditions, i.e. »exogenous« variables, and the relatively dependent conditions, i.e. »endogenous« variables.⁶ As in the causal case, the models come with a space of values representing contrast. One introduces the signature $\mathbf{S} = \langle U, V, R \rangle$. Where, like before, U is a finite set of exogenous variables, V is a finite set of endogenous variables and R is a function mapping every variable $X \in U \cup V$ to an at-least-two-membered set of assigned values. Put simply: $\mathbf{S2} = \langle U2 = \{Determinate\}, V2 = \{Determinable\}, R2 \rangle$

For example: if one is studying <an armchair which is pink because fuchsia> the formalism could be as follows: $\mathbf{S2} = \langle U2 = \{Fuchsia\}, V2 = \{Pink\}, R2 \rangle$, where $R2$ maps *Fuchsia* to $\{0, 1\}$ contrasting the armchair's being fuchsia (1) with its being scarlet (0) and maps *Pink* to $\{0, 1\}$ contrasting the armchair's being pink (1) with its being red (0).

(2) Next, like before, one incorporates the dependency functions by evaluating dependant conditions based on their parents.⁷ One introduces the linkage, a pair $\mathbf{L} = \langle \mathbf{S}, \mathbf{E} \rangle$ where \mathbf{S} is a signature as characterised in step (1) and \mathbf{E} is a set of structural equations. \mathbf{E} must once again cover every endogenous variable and contain an acyclicity constraint, preventing loops.

In the case of <the armchair which is pink because fuchsia>, $\mathbf{S2}$ (as described above), a natural linkage is $\mathbf{L2} = \langle \mathbf{S2}, \mathbf{E2} \rangle$, where $\mathbf{E2}$ is $\{Pink \leftarrow Fuchsia\}$ (outputting a 0 for *Pink* given a 0

⁶ These are the »fundamental conditions« on a metaphysical interpretation; and the »initial conditions« on a causal interpretation (Schaffer 2016).

⁷ These are the »bridge principles« on a metaphysical interpretation; and »the dynamics« on a causal interpretation (Schaffer 2016).

for *Fuchsia*, and a 1 for *Pink* given a 1 for *Fuchsia*).

(3) Last, just as in the causal case, one needs to say *how things de facto are*, by adding in the assignment: a pair $M = \langle L, A \rangle$ where L is a linkage as characterised in step (2) and A is the smallest function mapping every exogenous variable $U \in U$ to exactly one value.

In case of the armchair, one needs to say which determinate shade the armchair has (here: fuchsia or scarlet). One adds $M2 = \langle L2, A2 \rangle$, where $A2$ is the smallest function mapping *Fuchsia* to 1. By putting all together we have encoded, as Schaffer puts it (2016, p. 69): »how the [armchair]’s determinate shade sets its determinable colour«:

$$S2 = \langle \{Fuchsia\}, \{Pink\}, R2 \rangle \text{ where } R2 \text{ maps both } Fuchsia \text{ and } Pink \text{ to } \{0, 1\}$$
$$L2 = \langle S2, \{Pink \leftarrow Fuchsia\} \rangle$$
$$M2 = \langle L2, \{ \langle Fuchsia, 1 \rangle \} \rangle$$

Graphically one can model the case of the armchair which is pink because it is fuchsia like this:

$$Fuchsia \rightarrow Pink$$

Nothing has changed mathematically, beyond the labels on the variables. However, it’s doubtful whether the modifications does save the formalism.

2.3 Where causation and grounding part ways

Once we have an understanding of the formal details of the model an obvious question is: »is the model apt (for the purpose at hand)?« That is, is the model an adequate representation of a scenario? In the case of grounding, this seems dubious (*cf.* Koslicki 2016; Jansson 2018). In this section, I present Koslicki’s (2016) criticism of the structural equation model, by illuminating three of the central disanalogies between grounding and causation.

A first problem arises when we consider the first aptness constrain: replacing the »distinctness«-requirement with a weaker »non-identity«-requirement. This modification gives rise to a circularity in the application of the model to the case of grounding not present in the application of the model to the case of causation. Nor numerical identity nor mereological overlap are causal notions. Thus, when evaluating a causal scenario, reading »distinct« as neither numerical identity nor mereological overlap is not a case of begging the question. Conversely, interpreting »distinct«

as neither numerically identical nor connected by grounding seems problematic if we want to learn about alleged grounding connection. As Koslicki (2016) points out, one of the benefits of the structural equation model for causation is, after all, to help us distinguish (correctly) between mere correlation and genuine causation. Therefore, if the analogy between grounding and causation is successful, by using the structural equation model on cases of grounding, we should be able to distinguish (correctly) between mere correlation and genuine grounding. When confronted with two correlated phenomena δ and μ , we may ask »does δ ground μ ?«. The model should ideally supply us with the right answer. Given this success condition, it is problematic that we, in the case of grounding, are forced to define beforehand whether δ and μ de facto are connected via some grounding relation. This seems to undermine the usefulness of the application of the model on grounding since it obstructs our ability to detect a genuine ground-theoretic connection. If the model does require us to determine from the outset whether δ and μ are causally or ground-theoretically connected, the structural equation model only has one question to resolve, viz. in which direction the causal or grounding connection runs in the system at issue.

Next, consider the examples I gave earlier, viz. **S1** the situation where a coffee cup is being dropped to the ground and shatters versus **S2** the situation where an armchair's being pink is grounded in the armchair's being fuchsia. In the case of causation (**S1**), the exogenous and endogenous variables: \langle the coffee cup's being dropped to the floor \rangle and \langle the coffee cup's shattering \rangle are either occurring or not occurring. In the case of grounding (**S2**), the exogenous and endogenous: \langle the armchair's being fuchsia \rangle and \langle the armchair's being pink \rangle are either the case or not the case. Here, the second problem surface. For in **S1**, the contrast between the cup's being dropped versus not being dropped corresponds to the values 1 and 0—with the same conditions holding for both *Dropped* and *Shatter*. We are to assume, that if the first event, \langle the cup's being dropped \rangle , occurs, then the second event, \langle the cup's shattering \rangle , occurs too. In **S2**, the exogenous variable, *Fuchsia*, is assigned the value 1 if the armchair is fuchsia, and the value 0 if the armchair is scarlet. These two values represent two *distinct* states of affairs which can both be conceived as either being the case or not being the case, i.e. \langle the armchair's being fuchsia \rangle and \langle the armchair's being scarlet \rangle . But, as Koslicki (2016) points out, there is no direct link between these two states of affairs: if the armchair fails to be fuchsia, it is not thereby required to be scarlet instead, since all other determinate shades of colour are options for the armchair as well. The same point can be made in the case of the endogenous variable, *Determinable*. Thus, for the analogy to work, **S2** would need to include distinct variables for the various states of affairs in question.

When Koslicki (2016) tries to save the formalism—by including variables for various states of affairs—a third problem surface. Koslicki’s formalism (**S2***) differs in two important ways: (1) The contrast class represented by 1 or 0 is to be understood as corresponding to *the same* state of affair as either being or not being the case. Here: ⟨an armchair which is pink because fuchsia⟩. (2) If the model denotes the state of affair represented as *not* being the case e.g. in which *Fuchsia* is set to 0, it must be assumed compatible with various alternative state of affairs, all of which are to be represented by distinct variables (e.g. *Cerise*, representing the state of affairs consisting in ⟨the armchair’s being cerise⟩; *Scarlet*, representing the state of affairs consisting in ⟨the armchair’s being scarlet⟩ and so on.) However, as Koslicki observes (2016, p. 10), it’s doubtful as to whether **S2*** encodes »how the armchair’s determinate shade sets its determinable color«. For instance, consider a model where *Fuchsia* is being set to 0. The model leaves open if e.g. *Cerise* should be set to 1. **E2*** would thus in some instances generate the wrong results. This is because there are many different ways in which the armchair can be pink, and the state of affairs represented by *Fuchsia* captures only *one* of these ways. Ergo, it would be wrong to define **E2*** in a way where it assigns 0 to *Pink* whenever 0 is assigned to *Fuchsia*; the state of affair in question might de facto be that the armchair is pink, only not fuchsia.

A fourth more general argument against understanding grounding using structural equation models has been discussed by Jansson (2018). In the case of deciding upon relevant variables in a specific casual model, we can sometimes rely on local theories of the causal mechanism or process in question, for which there is a posteriori evidence. This allows us to select—under objective constraints—relevant variables for the possibilities that ought to be captured by the model. For instance, if we’ve modelled **S1** ⟨the coffee cup’s being dropped to the floor and shatters⟩ and got it wrong we can analyze it by appealing to considerations from what we take the causal processes and causal mechanisms of coffee cups shattering to be like. Conversely, in the grounding case, these sorts of evidence are not available. Simply because the relations that we are modelling in the grounding cases do not, in general, seem to allow for this. Without objective restraints grounding theorists are left to select what possibilities are to be represented by what variables based on non-objective factors, e.g. the interest of the modeller. Thus, in the grounding case, it seems we need some sort of substitute for the local theories of causal mechanisms or processes doing the same job of putting objective restraints on model aptness. Otherwise, these judgements are left to be made by the modeller. This is a serious problem if we aim for objective constraints on our models.

The application of a single formalism to both grounding and causation is an important

argument in support of the analogy. In this section, I've argued that the application of the structural equation model to the case of grounding is not as straightforward as proponents for the analogy lead us to believe. Thus, we have reason to take the disanalogies between causation and grounding seriously. Indeed, this split might indicate that the supposed similarities don't run as deep as proponents of the analogy posit. This is the topic for the next section.

3. The split

In this section, I start by addressing some arguments in favour of the analogy, namely alleged logical similarities, before turning to differences where causation and grounding part ways.

3.1 Logical features: similar how?

Apart from the difficulties in trying to enfold grounding and causation in the same model, more serious differences emerge when one cross-examines the two notions' logical features. These are among the core arguments for the analogy, consequently if they should prove questionable the analogy weakens.

First, *transitivity*. Cases of pre-emption threaten the transitivity of causation. These are cases where the cause triggers and then cuts off an alternative causal pathway to the effect. Using Hitchcock's (2001, p. 276) example: consider a hiker who sees a boulder rolling towards them and ducks, the boulder passes harmlessly overhead and they survive. Plausibly, the falling rock caused their ducking, and their ducking caused their survival, but the falling rock did not cause their survival.⁸ As Schaffer (2012, pp. 126-127) proposes, we can generate structurally similar cases to challenge the transitivity of grounding:

- (1) The fact that O has a dent, D, grounds the fact that O has shape S.
- (2) The fact that O has shape S grounds the fact that O is more-or-less spherical.

Given transitivity the conclusion would be:

∴ The fact that O has a dent, D, grounds the fact that O is more-or-less spherical.

⁸ This example is described by Hitchcock (2001) and attributed to an early draft of Hall (2004).

But this is not the case: the dent, D, does not make a difference to whether O is more-or-less spherical, i.e. the dent does not ground the sphere being near-spherical.

However, Bernstein (2016) argues that these arguments are importantly different. The counterexample for grounding involves *two* grounding relations: (1) mereological dependence (the dented sphere and the shape) and (2) determinate/determinable relationship (the relationship between the sphere's shape and its more-or-less sphericity). There is no analogous structural difference to be made for causal transitivity.

Secondly, *asymmetry*—a feature which has been challenged in the case of grounding. Thompson (2016) and Barnes (2018) have both argued that grounding is non-symmetric rather than asymmetric. One of Thomson's (2016) example (adapted from Fine 2001) is the mass, density and volume of a homogeneous body, where each pair of these parameters is sufficient to derive the third *dito*. It would be groundless to privilege any two of them as fundamental with the third being derivative. Indeed, we might view the values of each parameter as grounded in the values of the other two. As a consequence we're required to give up on asymmetry for partial ground, thus also giving up on either irreflexivity or transitivity or both. Another counterexample (due to Rodriguez-Pereyra 2015) to the asymmetry of grounding is the following: [this fact obtains] is grounded in [[this fact obtains] obtains] and *vice versa*. Arguing in terms of propositions rather than facts, Rodriguez-Pereyra's view is that there are cases in which »the truth of a proposition depends on its subject matter *and vice versa*« (2005, p. 22). Bernstein (2016) argues that one *prima facie* reason to posit ground to be an asymmetric relation is that ground is supposed to be »directed« in some way for it to structure the world the way it does. However, as opposed to causation ground is not (typically) taken to generate or transfer energy. Consequently, there is no principled reason saying that the grounders and groundees can not have a reciprocal relation, i.e. be symmetric. The fact that grounding is synchronic while causation is diachronic leaves this possibility open for grounding; but not for causation.

Thirdly, grounding is generally considered *irreflexive* since grounding is to structure being hierarchically. Causation meanwhile is considered irreflexive due to the temporal arrow (once again, the synchronic vs diachronic characteristics give rise to disanalogies). Following Hume: an event out of causal order suggests a temporal exception, but there is nothing intrinsic to a cause saying it must come before its effect. Indeed, the fact that a cause comes before its effect is not because of the nature of the separate pieces (see Bernstein 2016; Morris & Brown 2020). Conversely, an entity out of place in the grounding hierarchy contravene the idea of ground: self-grounding is not possible, accepting self-grounding would be to violate the very structure that

grounding provides (Bernstein 2016). Thus, the theoretical functions of causation remain intact even though one rejects the idea of causation being irreflexive. The same is not true for grounding. As Jenkins (2011) points out: rejecting the irreflexivity of dependence requires a piece of new theoretical machinery doing the job the irreflexive dependence relations were supposed to do.

3.2 Structural differences: where grounding and causation diverge

Thus far I've discussed the supposed analogous traits between causation and grounding, arguing they don't hold up under closer scrutiny. I now move to the most obvious *disanalogies* between grounding and causation, undermining the case for the analogy.

The first well-known disanalogy between grounding and causation is that the former is (typically) synchronic whereas the latter is (typically) diachronic.

Proponents of the analogy tend to gloss over this difference, arguing that there are cases of synchronic causation and diachronic grounding. Indeed, Wilson gives examples where these characteristics do not apply, for instance: if a time traveller presses a button at t to travel back in time to present their former self with a set of new blueprints this may be the cause of another event also occurring at t : the existence of some well-used blueprints. (2018, pp. 729-730); as well as cases that might be considered as diachronic grounding: for instance, my ancestral lineage grounds the fact that I am a human (2020, p. 64).

However, this difference runs deeper than Wilson et al will have us believe. This split illuminates several cases where grounding does not have an obvious parallel in causation. As Bernstein (2016) points out, inquires regarding the metaphysical relationship between causation and time are more complex than those involving ground and time. Pertinent metaphysical questions concerning causation and time; such as whether causes always precede their effects, or whether causation has an intrinsic direction, do not occur in the discussion on grounding since grounders must be prior to what they ground; and the intrinsic direction of grounding is clear: grounds ground groundees.

Further, if we take the analogy seriously one will have trouble distinguishing grounding from simultaneous causation i.e. cases where cause occurs simultaneously with their immediate effects. It seems wrong to posit cases of simultaneous causation as actually being cases of grounding. Take for example ⟨a person depressing a couch⟩. This is a case of simultaneous causation, not a case of grounding. Thus, the analogy makes it difficult to distinguish these sorts of cases if grounding is, or is like, synchronic causation.

Lastly, Bernstein (2016) points out how the diachronicity of causation allows for modifiers that hasten («hasteners») or delays («delayers») an event's occurrence. For instance, since all people are going to die, killers who hasten the death of people are hasteners; while doctors who treat people are delayers. Between these two modifiers, there is a causal asymmetry: hasteners are causes while delayers are not. Moreover, not every hastener is a cause: something can make a difference to an event without causing it to happen. In contrast, since grounding (typically) is synchronic there is no room for hastening or delaying.

These three points undermine the claim that the synchronic/diachronic distinction is merely superficial.

The other significant difference is the two notion's connection with fundamentality. It is a common idea that the world—understood as the fusion of all concrete entities—has a layered structure. »Metaphysical foundationalism« can succinctly be described as the thesis that the world is hierarchically structured from fundamental facts or entities to increasingly derivative facts or entities. Or, using the notion of ground: every concrete fact or entity is *grounded* in what is more fundamental. The notion of grounding is essential to this thesis (Bliss & Trogdon 2016). Grounding thus seems to be intimately linked with fundamentality; causation, on the other hand, is not (typically) considered connected to fundamentality in this way.

One way to explain this difference (due to Wilson 2018) is to trace it to a difference between how causal versus grounding dependencies are mediated: causal dependencies are mediated by the laws of nature, which typically relate events at one time to events at another. In contrast, grounding is not mediated by any laws of nature, but principles of logic or metaphysics that do not (typically) come with diachronic constraints. This explains why causal connections (typically) structure the world through time, while grounding connections (typically) structure the world through layers, with respect to fundamentality.

However, this split should not be glossed over, in this vein several further *disanalogies* can be found. Bernstein (2016) points to three of them.

Firstly, causation can be in *indeterministic* while grounding can not. Cause and effect can be linked through probability: δ causally depends on η if the chance of δ would have been significantly lower without η 's occurrence. There are events which raise the probability of their effect without causing them, and causes which lower the probability of their effects. Sufficient grounds for some entity, on the other hand, always raise the probability of that entity's occurrence to 1. Thereby ground always raises the probability of their groundees. Indeed, grounders *necessitate* groundees. Grounding can thereby not be indeterminate since reality is—at the fundamental level—

determinate.

Secondly, causation by omission, i.e. an event where something that does *not* happen is the cause of something else, do not have any parallel in grounding. Omissions can be *causes*, as when one doesn't put the tulips in water which causes them to die, *effects*, as when one steers the bicycle away from a pit, causing the absence of an accident, and *intermediaries*, as when one doesn't fry the eggs, which in turn causes a delay with breakfast. Omissive causes are basic components of causation. In grounding, however, there are no such cases, especially if we posit the relata to be spatiotemporally located entities rather than facts: non-things can't ground things; non-things can't be (bottom level) fundamentalia. Neither is the problem solved by positing the relata of grounding to be facts. Negative facts might ground other negative facts, like the fact that my garden doesn't have a peach tree grounds the fact that some garden doesn't have a peach tree. However, negative facts seem ill-suited to be explanatory fundamentalia; they are not part of the fundamental level of facts that constitutes the world.

Thirdly, grounding is thought to be an *internal* relation, i.e. one that is fixed by how the relata *are*. Bennet (2011) suggests grounding is a *superinternal* relation, i.e. one that is fixed by the nature of *one* of the relata. One side of the relation thus guarantees the nature and existence of the other(s). Causation, on the other hand, is thought to be an *intrinsic* relation, i.e. one that depends on what happens between the relata. The nature and existence of one causal relatum do not guarantee ditto of another, nor that there exists causal relation between them. There is thus extra construction in the causal case not present in the grounding case. To use Schaffer's (2016, p. 95) terms: grounded entities seem to »inherit their reality« from its grounds whereas caused entities do not »inherit their reality« from their causes. Instead, causation involves a kind of »bringing into existence« (Bernstein 2016, p. 26). Consequently, if a world has the same relata as our world, it could hold different causal relationships (from our world), but not different grounding relations.

3.3 In the debate

Finally, to further cleave apart grounding from causation I turn to divergences in the debates about the two notions. To use Bernstein's (2016) term, these are the »dialectical differences«. One of these differences is particularly telling: it reveals that moves in one debate are unconvincing in the other. Attempts to extend solutions from the case of causation to the case of grounding seem to falter, which undermines the analogy's usefulness. This is the fact that it's still contested whether we have reason to believe that grounding exists as a distinctive notion apart from other dependant relations.

Some argue that grounding is not, in fact, *one* phenomenon, but a collection of heterogeneous phenomena (*cf.* Daly 2012; Hofweber 2009; Wilson 2014). According to Koslicki, there is doubt as to whether the phenomena collected under the rubric of »grounding« really are unified by a single relation, criticising: »by treating a collection of phenomena which is heterogeneous as though they were homogeneous, we have, if anything, taken a dialectical step backwards.« (2015, p. 307) Using Wilson's (2014) terminology, the debate concerns whether »Grounding-with-a-capital-G« is a distinctive relation separate from similar small-g-grounding relations e.g. composition, constitution, realisation, supervenience, the determinate/determinable relation.⁹ If these relations constitute a kind of grounding relation, Wilson (2014) asks, what use is the notion of grounding? Indeed, Wilson considers the notion uninformative. The difficulty to pin the concept down and offer a unified description undermine the analogy with causation: the current debate on the nature of causation primarily concerns *which* sort of analysis can be given to claims involving causation, not *whether* causation per se is a distinctive notion apart from other dependence relations. Further, there is an emerging consensus over the leading formalism for causation (Schaffer 2016). Conversely, as Bernstein (2016) points out, ground is a theoretical primitive, it's unanalysable; this is canonical in the literature on grounding. Primitivists about causation, on the other hand, is a minority view.

The disagreements concerning grounding; its evasive nature; its informativeness, are all avenues of further exploration. This investigation will most likely uncover further dichotomous traits between grounding and causation; due to the many disanalogies. In further discussions, grounding would thus benefit from not being illuminated in the image of causation.

4. Summary and conclusions

The notion of ground is gaining momentum in the literature; now being a popular topic for investigation. While causation has been in the philosopher's toolkit for a long time, it is only in recent years that grounding has attracted metaphysicians' attention. Our understanding of grounding is still in its early days. This, however, does not prevent the term from picking out a distinct metaphysical relation. We do not need a complete theory to refer to and theorise about grounding. Indeed, the persistent use of the notion gives us reason to believe that we are in the vicinity of something illuminating. With that said, many substantive questions about grounding remain to be answered (or addressed). It's tempting to use analogies to better understand new phenomena. But in

⁹ What Bennett (2017) calls »building relations«.

doing so we must be careful to make sure the analogy actually does the work it's set out to do. The grounding-causation analogy seems to strain for similarities while glossing over obvious dissimilarities. The attempt to enfold the two notions in the same formalism, viz. structural equation models, is not as straightforward as have been argued. The logical and structural similarities do not seem to run as deep as proponents of the analogy argue. And the scepticism about grounding does not have a clear parallel in the discussion on causation. These disanalogies underscore my claim that grounding seems to be neither a species to the same kind of relation (viz. »directed determination«) as causation is nor a kind of causation, neither does causation seem to be an apt guide to ground. Instead, the analogy might prevent us from discovering what actually characterise each notion. Undoubtedly, grounding and causation similarities can be found in a variety of instances, but these supposed similarities seem to be mainly superficial, not holding up under closer scrutiny.

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