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CAUSE

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1. Introduction

Compare the following claims:

(1) The window shattered because Suzy threw a rock.
(2) The shirt is red because it is maroon.
(3) The singleton set containing Sonia Sotomayor exists because Sonia Sotomayor exists.

Each of (1), (2), and (3) explains one state of affairs in terms of another.[1] But whereas (1) is causal, (2) and (3) apparently involve a noncausal form of explanation, which according to many indicates the presence of a grounding relation. The notion of ground is often introduced as the metaphysical analogue of the notion of cause. For the most part, no more is said about the connection between the two notions, for instance, the extent of the analogy or whether theorizing about one notion might shed light on the other. But in recent literature, some philosophers have developed a sustained analogy between grounding and causation, with the end goal of showing that they present a unified phenomenon. Although there are other questions about the connection between grounding and causation, this chapter centers on the unification claim.[2]

The unification claim will be made more precise in Section 2. Section 3 details the main alleged similarities between grounding and causation, with special attention to the interventionist and mechanistic accounts. Section 4 details objections to the unification claim, and Section 5 comments on future directions for work. In what follows, I will assume that there are grounding and causal relations—the discussion that follows may be reformulated for those who hold that there are truths about grounding or causation, even if there are no corresponding relations in the world.

2. Some Positions

I follow Sara Bernstein (2016: 22) in distinguishing two theses:

Unity: Grounding and causation are species of the same genus.
Illumination: Issues in grounding can be illuminated by appealing to causation and vice versa.

Note that Bernstein actually characterizes Unity (or "grounding-causation unity," as she calls it) as the thesis that grounding and causation are merely "nominally distinct," a phrase apparently borrowed from Schaffer (2016a: 94). But as far as I know, no one defends the thesis that grounding just is nomological causation. Meanwhile, Illumination (or "grounding-causation comparison") is a methodological claim that admits of degrees.

There is variation in how and whether Unity and Illumination are defended. Alastair Wilson (2016, 2018) argues that grounding just is metaphysical causation and that metaphysical and nomological causation are both species of causation. Jonathan Schaffer (2016a, 2016b) and Karen Bennett (2017) hold that grounding is not a species of a causation but that both are species of directed determination (for Schaffer) or building (for Bennett). These defenders of Unity thus have an obvious path toward Illumination: the notions of ground and cause are mutually illuminating because they share the features unifying the genus. However, all acknowledge that there are significant differences between grounding and causation, just as there are differences between two species of any genus.

Other metaphysicians accept Illumination without accepting Unity. For instance, Kelly Trogdon (2018) does not take a stance on Unity; however, he argues that there are important similarities between causal mechanisms and what he calls grounding mechanisms. Arguably, many defenders of ground are in the same camp, in the sense of accepting some degree of similarity between ground and cause without outright endorsing Unity. Grounding has been introduced as "metaphysical causation" in articles that do not further pursue the analogy, e.g., in Schaffer (2012: 122) and Ted Sider (2011: 145). More commonly, the topic has been introduced using notions such as noncausal determination, explanation, or dependence, e.g., in Paul Audi (2012: 686), Selim Berker (2018: 507), and Michael Clark & David Liggins (2012: 812). However, because such defenders do not draw extended, direct comparisons between grounding and causation, I will focus primarily on the views defended by Wilson, Schaffer, Trogdon, and Bennett.

Finally, Bernstein (2016) has argued that both Unity and Illumination are false. There may be similarities between grounding and causation, but this does not show that they stand in any interesting relation to each other, at least not with the significance that has been ascribed. Kathrin Koslicki (2016) does not explicitly reject either thesis, but she objects to some of Schaffer's claims about the similarities between grounding and causation via interventionist models. Presumably, these criticisms would also apply to Wilson, who also appeals to interventionist models to make the case for Unity.

3. In Defense of Unity and Illumination

Defenders of Unity and/or Illumination point to a long list of similarities between grounding and causation to justify their claims. In Section 3.1, I catalogue some general similarities between the two notions. Sections 3.2 and 3.3 address specific alleged analogies with structural equation models (as defended by Schaffer and Wilson) and mechanistic models (as defended by Trogdon). Section 3.4 examines Bennett's views on building relations, including her defense of potentially illuminating analogies between grounding and causation. In each of these sections, some of the differences acknowledged by the defenders of Unity and/or Illumination will be noted.

3.1 General Similarities Between Grounding and Causation

The following list is not intended to be a full account of similarities between grounding and causation but is rather a somewhat miscellaneous list of similarities that have been pointed out

in the literature. Items (i) and (ii) are relatively superficial; items (iii) through (v) may indicate deeper connections.

(i) Both arguably form partial orders.

> Where there is disagreement over such features, it seems that structurally similar objections and replies may be advanced. See Wilson (2018: 727–28) and Schaffer (2016a: 55), as well as Chapter 17 of this volume.

(ii) The full vs. partial ground distinction is analogous to the sufficient vs. contributory cause distinction.

> Just as there can be multiple sufficient causes of a state of affairs, there can be multiple full grounds of a state of affairs.

(iii) Both can be understood as production-based or dependence-based notions.

> Ned Hall (2004) distinguishes between a production-based notion of causation and a dependence-based notion. Causal production may be made more precise, but it concerns the idea of one state of affairs generating or bringing about another. Causal dependence is understood through patterns of counterfactual dependence; in its simplest form, for two states of affairs x and y, x causes y iff y depends upon x iff had x not occurred, y would not have occurred.
>
> Grounding may likewise be understood as production based or dependence based, though the details may differ. Both Schaffer (2016a: 54) and Wilson (2018: 733) draw this distinction in the grounding case, though Wilson identifies grounding with grounding dependence. Trogdon (2018: 1292) seems to suggest that grounding is grounding production; Bennett (2017: 68–69) explicitly endorses this, though she also acknowledges that both grounding and causation are reflected in patterns of counterfactual dependence.

(iv) Both back explanations.

> In response to some why-questions, e.g., Why did the window break?, we cite nomological causes. In other cases, e.g., Why does singleton Sonia Sotomayor exist?, the answers appeal to grounds. Just as causal explanations are backed by causal relations in the world, metaphysical explanations are backed by grounding relations in the world. Schaffer (2016a: 84–87) argues that we should not conflate relations in the world with explanations among facts or sentences. In fact, he holds (89) that there is just one kind of explanation, which can be backed by grounding or causation or both. See also Schaffer (2016c: 145–46). Wilson (2018: 728–29), Trogdon (2018: 1303), and Bennett (2017: 61) also accept the distinction between grounding or causal relations and explanations. See Chapter 8 of this volume for discussion of what "backing" means in the context of grounding explanation.

(v) Both are similarly connected to notions such as laws, necessity, and counterfactuals.

> Because of the connection to explanation, both grounding and causation thereby stand in similar relations to other notions.
>
> Particular cases of grounding or causation are thought to be supported by more general principles, respectively metaphysical or nomological laws. This claim is compatible with many different views about the nature of such laws; for the grounding case, see Chapter 31 of this volume.

Both relations are thought to be necessitating: if the grounds exist, then the grounded must as well; likewise, if the cause occurs, then the effect must as well. However, there is controversy in each case. For discussion of grounding necessitation, see Chapter 10 of this volume. For the causal case, see Elizabeth Anscombe (1975).

Finally, as noted in item (iii) of this list, causation is believed to have intimate ties to counterfactual conditionals—counterfactual dependence is one possible mark of a causal connection. Likewise, counterfactual dependence may indicate a grounding connection, though there may be a need to venture into *counterpossible* dependence in the case of grounding (see Section 4.2).

3.2 *Structural Equation Models*

Schaffer (2016a, 2018) and Wilson (2016, 2018) each independently argue that there is a systematic analogy between ground and cause, as evidenced by the fact that each may be captured using the structural equations models of the interventionist framework. This constitutes their case for both Unity and Illumination, for the structural equation models allegedly provide parallel insights in both cases. Note that they are only considering cases in which there is a determination relation between the causes (grounds) and their effects (grounded), since grounding is typically thought to be necessitating.

The interventionist framework was developed as a theory of causation by Joseph Halpern and Judea Pearl (2005a, 2005b), Christopher Hitchcock (2001), Judea Pearl (2009), and James Woodward (2003), among others. The following is a simplification of the formalism actually used in the causation literature, though it is not much simpler than that described in the grounding literature.

A structural equations model consists of:

(i) a set of variables and the values they take (specifically, a set of endogenous variables and a set of exogenous variables),

(ii) a set of structural "equations" (see what follows) exhibiting the dependencies between variables, and

(iii) an assignment of actual values to variables (specifically, an assignment of values to the exogenous variables).

Consider the simple causal example in which Suzy throws a rock through a window, which then shatters. We can model the connection between the relevant types of events as follows. Let C be the variable that takes the value 1 if the rock is thrown and 0 otherwise, and let E be the variable that takes the value 1 if the window shatters and 0 otherwise. The single structural equation in this case is:

$$E = C$$

Importantly, the symbol "=" is conventionally used to denote not identity but a counterfactual dependence relation indicating how the variable on the left depends upon the variable (or variables) on the right. If the model assigns $C = 0$, then $E = 0$, and if the model assigns $C = 1$, then $E = 1$. This model thus represents the causal dependency of the window's shattering upon whether or not Suzy throws the rock. Note that throughout, the models strictly speaking concern types rather than tokens of events and causal relations. There have been attempts to characterize token causation via causal models, e.g., in Hitchcock (2001).

A causal model may be visually represented by a directed graph with nodes corresponding to variables.

$$C \longrightarrow E$$

We can determine the truth values of certain counterfactuals by performing interventions on the variables upon which other variables depend in the model. For instance, whatever the actual value of C, we intervene on it by setting $C = 1$. Given the structural equation associated with the model, it follows that $E = 1$. Likewise, an intervention of $C = 0$ yields $E = 0$. From these observations, we may infer some counterfactual truths, namely:

(4)   If Suzy had thrown the ball, the window would have shattered.
(5)   If Suzy had not thrown the ball, the window would not have shattered.

Both Schaffer and Wilson draw an analogy between this simple case of cause and (variants on) the following two cases of ground. The first is the case of a shirt's being maroon grounding its being red. Let C be the variable that takes the value 1 if the shirt is maroon and 0 otherwise, and let E be the variable that takes the value 1 if the shirt is red and 0 otherwise. As in the causal case, the single structural equation is:

$E = C$

Likewise, let C take the value 1 if Sotomayor exists and 0 otherwise, and let E take the value 1 if singleton Sotomayor exists and 0 otherwise. This model thus supports the following counterfactuals:

(6)   If Sotomayor had existed, then singleton Sotomayor would have existed.
(7)   If Sotomayor had not existed, then singleton Sotomayor would not have existed.

Schaffer explicitly adopts contrastive theories of both cause and ground (and presumably Wilson would agree). We cannot simply think of Suzy's throwing the rock as the cause of the window's shattering; rather, Suzy's throwing the rock rather than not throwing the rock is the cause of the window's shattering rather than remaining intact. Likewise, the shirt's being maroon rather than its being navy grounds the shirt's being red rather than its being blue. Thus, in the model above, $C = 0$ represents the shirt's being navy, not the shirt's failing to be maroon, and $E = 0$ represents the shirt's being blue, not the shirt's failing to be red. Note that the contrastive treatment leads to the failure of transitivity in both cases (Schaffer 2005; Hitchcock 2001).

These are only the simple cases. One of the motivations for the interventionist account of ground is the ways in which it parallels the interventionist account of cause in more complicated cases. For instance, consider cases of symmetric causal overdetermination, in which two states of affairs obtain, each of which is by itself sufficient for some effect. If Suzy and Billy both throw rocks that hit the window at the exact same time, then the window's shattering is overdetermined. In this case, C and D represent whether Suzy and Billy each throw their rocks, and E represents whether the window breaks:

$E = \max(C,D)$

This can be represented graphically as:

C

E

D
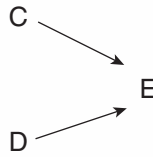
For a case of grounding that uses the same structural equation, consider Elena Kagan and her singleton set alongside Sotomayor and hers. C represents whether Sotomayor exists, as before, and D represents whether Kagan exists. Unlike before, E represents whether either singleton Sotomayor or singleton Kagan exists.

Interventionism about causation is thought to be able to handle cases that simple counter-factual theories cannot, such as symmetric overdetermination, omission, and early pre-emption. For examples of omission and early pre-emption in both the causal and grounding cases, see Section 5 of Wilson (2018), though see also Section 4.1. Note, however, that interventionist accounts are still counterfactual theories of causation, since the models support counterfactual reasoning via interventions on variables in the model. Interventionist models thus do not provide reductions of causation or of grounding, and not all interventionist models correspond to genuine cases of grounding or causation.

Wilson also holds the following difference between grounding and causation: causation, unlike grounding, is mediated by the laws of nature. For Wilson, mediating principles determine which structural equations are part of models of genuine cases of causation (or grounding). So in the causal case, the dependencies between the variables of an interventionist model are determined by the laws of nature. They thus differ in their relationships with concrete physical processes; causal dependencies but not grounding dependencies have consequences for how physical events in the world unfold. Wilson (2018: 746) holds that grounding is instead mediated by principles of logic or metaphysics such as the laws of logic, the axioms of set theory, or the laws of mereology. Schaffer (2016a: 57–58) also thinks that grounding stands in a similar relation to laws of metaphysics as causation does to the laws of nature.

3.3 Causal- and Grounding-Mechanical Models

Trogdon (2018) has defended Illumination by appealing to causal mechanisms and causal-mechanical explanation. This section follows Trogdon's lead in characterizing his view and may not be representative of how others would understand these notions. See Holly Andersen (2014a, 2014b) for different senses of the term "mechanism."

Trogdon assumes a systems view of causal mechanism, on which causal-mechanical models describe how the parts of a system interact with each other to produce a phenomenon. This corresponds to a type of scientific explanation, namely, causal–mechanical explanation. For Trogdon, explanations are propositions or other abstract structures that accurately and informatively represent the world's structure. Thus causal explanations accurately and informatively represent some aspect of the world's causal structure.

Likewise, claims Trogdon, there is a type of metaphysical explanation that appeals to grounding-mechanical models. In the grounding case, mechanisms are instances of metaphysical determination relations (or chains of such relations), where the relata are constituents of the facts that stand in grounding relations. For instance, corresponding to the fact that Sotomayor exists grounds

the fact that her singleton set exists, there is a metaphysical determination relation (namely, set formation) holding between Sotomayor and her singleton set. This is a grounding mechanism.[3] On an alternative view, the nomic subsumption view, grounding explanations appeal to laws of metaphysics. The grounding mechanism view has no such requirement on grounding explanation. This parallels the broad division between theories of causal explanation that appeal to laws of nature versus the causal mechanisms views that do not.

As noted, Trogdon defends only Illumination, not Unity. In favor of Illumination, he argues that the notion of grounding-mechanical explanation can do theoretical work in philosophy. Namely, it creates a demand for a specification of the grounding mechanisms in play whenever someone makes a grounding claim. Consider the debate between the priority monist and the priority pluralist about concrete objects. Whereas the priority pluralist recognizes a plurality of fundamental objects, the priority monist holds that the entire concrete cosmos is the sole fundamental object. According to Trogdon, the priority monist must specify how each "subcosmos" state of affairs ultimately depends upon the cosmos. Likewise, the priority pluralist must specify how each state of affairs ultimately depends upon the fundamental concrete objects.

3.3 Building Relations

Bennett's (2017) approach differs from previous defenders of Unity and/or Illumination in not treating grounding as the most significant metaphysical analogue of causation. Instead, Bennett subsumes both under the class of building relations, which are a family of metaphysical determination relations. These include relations such as composition, constitution, set formation, realization, as well as grounding and causation. The addition of the latter two is unusual in two respects. First, grounding is placed alongside the more familiar relations rather than as the genus to their species or in some unifying role. Second, causation is included among rather than contrasted with such relations.

Bennett recognizes that there are differences between individual building relations, including the nature and number of relata. But they are unified by satisfying jointly necessary and sufficient conditions, namely, being asymmetric, necessitating, and generative, where generativity is, according to Bennett, what licenses locutions such as "in virtue of," "because," and "explain." This does not mean that there is a single building relation of which the other relations are determinates or species or which unifies the other relations. Nonetheless, Bennett holds that they form an interesting and theoretically useful kind.[4]

Bennett explicitly defends Illumination in the course of arguing that causation is a building relation—in fact, her defense of Illumination constitutes her defense of Unity. She compares causation with so-called "vertical" building relations, those that hold synchronically rather than diachronically. Bennett also argues that the allegedly "vertical" noncausal building relations may also hold across time; see her (2017: 83–99). Here are five questions about causation that can also be asked about other building relations, including grounding (and whose answers may illuminate each other):

(i) Is causation built?
(ii) Must chains of causes terminate?
(iii) Does every state of affairs have a cause?
(iv) Is there causal overdetermination?
(v) What are causal roles?

Bennett's point isn't that some answer to one of these questions carries over to the grounding case or vice versa but that the analogy may be helpful in exploring answers in each case. Bennett (2017: 78) also suggests adopting the methodological principle that "where and when parallel questions arise about causing and vertical building, the default position should be to adopt parallel answers to them."

4. Objections to Unity and Illumination

The main objections to Unity and Illumination come from two sources: Bernstein's (2016) wholescale critique of both Unity and Illumination and Koslicki's (2016) specific objections to Schaffer's interventionist models for grounding. This section lists some differences between grounding and causation that underlie potential or actual objections to Unity or Illumination.

Note that some differences have been acknowledged by defenders of Unity or Illumination themselves who do not take such differences to undermine either thesis. After all, none of them claim that causation and grounding are exactly analogous. But this might elicit a skeptical reaction: if defenders are not claiming an exact analogy, how should we evaluate Unity and Illumination? What similarities or dissimilarities should make a difference to the truth of these theses? Arguably, these questions have not been satisfactorily addressed in the literature.

4.1 General Differences

(i)   Causal explanation is significantly different than grounding explanation.

Michael J. Raven (2015: 325) argues that it is not obvious how to model grounding explanation on causal explanation. Grounding explanations need not involve "traditional hallmarks" of causal explanation, e.g., transference of power, a nontrivial statistical relationship, or asymmetric counterfactual dependence. And grounding explanations can occur without causal explanations.

(ii) Causation but not grounding can be indeterministic.

Schaffer (2016a: 95) acknowledges this difference, saying that once the restriction to deterministic causation is lifted, the formalisms for causation and grounding no longer coincide. This and the next difference are among Schaffer's reasons for rejecting Wilson's claim that grounding and nomological causation are both species of a single causal relation (though he does not direct his criticisms at Wilson, since the views were developed independently).

(iii) Grounding but not causation must be well-founded.

Schaffer holds that grounding chains must terminate (see also Schaffer 2003). But in the causal case, there is no "transference of reality," and thus causal chains need not terminate.

(iv) Grounding is synchronic whereas causation is diachronic.

This difference is generally accepted. At the same time, Wilson (2018: 729–30) points out that there are potential counterexamples. For instance, quantum theory posits what looks like simultaneous causal action-at-a-distance, and Wilson's being human rather than a swampman may be grounded in his past causal history. According to Wilson, the reason that grounding is generally synchronic while causation is

generally diachronic is that only the latter is mediated by laws of nature, which typically relate states of affairs at different times. This difference underlies other differences between grounding and causation, e.g., that grounding is necessitating, whereas causation can be indeterministic. Bernstein (2016: 24–25) objects that this difference is significant.

There is a related alleged difference between grounding and causation: whereas the latter obtains between wholly distinct states of affairs, the former obtains between merely nonidentical states of affairs. See Gideon Rosen (2010: 118) and Schaffer (2016a: 75–76). Koslicki objects to the weaker constraint of nonidentity in the grounding case; see her (2016: 109–11).

(v) The comparison between causal production/dependence and grounding production/ dependence is inappropriate.

Bernstein objects to the claim in Section 3.1 that there is a distinction between grounding production and grounding dependence that mirrors the distinction in the causal case. She points to Schaffer's claim that whereas states of affairs inherit their "reality" from their grounds, there is no analogous transfer from cause to effect. She adds that there is no analogue in grounding of the view that causation involves a transfer of energy or "mark." Note that Bennett, who identifies grounding with grounding production, acknowledges that there are accounts of causation that involve transmission of a conserved quantity, unlike in the grounding case; see her (2017: 69).

(vi) There may be important differences between causal omission and preemption on the one hand and grounding omission and preemption on the other.

Causation by omission seems possible—for instance, one's failure to water a plant may cause it to die. However, Bernstein (2016: 26–27) argues that there is no direct analogue in the grounding case, since "non-things" (as she puts it) cannot be grounds. She also argues (2016: 28–30) that causal preemption fails to have a direct grounding analogue. Consider a classic case of preemption, in which Suzy's rock throwing prevents Billy's own rock throwing from shattering the window. Wilson (2018: 24) suggests a grounding analogue: the presence and arrangement of his particles preempts some subset of them constituting a person. But Bernstein points out grounding preemption must involve intimately connected relata at different levels of specificity, whereas causal preemption may involve entirely distinct relata at the same level of specificity. Furthermore, counterfactual reasoning about grounding preemption requires reasoning about the impossible; see the next subsection.

4.2 Objections to Grounding Interventionism

The objections in this subsection are framed as objections against the interventionist model of grounding, even though they may have more general upshots.

(i) Counterfactual reasoning involving grounding requires counterpossibles.

In Wilson's case of grounding preemption in the last subsection, the presence and arrangement of his particles (**Particles**) preempts some subset of them (**Subset**) constituting a person. While **Subset** can exist without **Particles**, **Particles** cannot exist without **Subset**. So reasoning about whether the person would still exist if **Particles** but not

Subset existed requires (nontrivial) counterpossibility, which has been independently controversial; see Francesco Berto and Mark Jago (2018).

Wilson himself acknowledges the need for counterpossibles in his interventionist framework. In the language of this framework, an independent intervention upon Subset is not possible, since **Subset** may not exist without **Particles**. Wilson (2016: 719) points out that counterpossibles are required for even simple cases, such as Sotomayor's existence grounding her singleton's existence. His own conclusion is merely that acceptance of grounding is tied to acceptance of counterpossibles.

(ii)   The interventionist framework cannot capture various grounding dependencies.

Consider again the case of a shirt's being maroon grounding its redness. On Schaffer's contrastive interventionist framework, we let C be the variable that takes the value 1 if the shirt is maroon and 0 if it is navy, and let E be the variable that takes the value 1 if the shirt is red and 0 if it is blue. The single structural equation is $E = C$.

Koslicki (2016) objects that there are several dependencies not captured in this model. First, the alternative to the shirt's being maroon (or red) is the shirt's being navy (or blue), when really there are many other options. But a revised model on which $C = 0$ if the shirt is not maroon (or $E = 0$ if the shirt is not red) incorrectly represents the dependencies, since $E = 0$ does not follow from $C = 0$. Second, the model does not capture certain necessities, such as the fact that it is metaphysically necessary that the shirt has some color or other; see Koslicki (2016: 109) for other examples. Koslicki then argues that the shirt case is not really analogous to the simple causal case of the ball and the window; it is more like a case of massive causal preemption, since the shirt's being a determinate color prevents it from having any other determinate color. But massive causal preemption is a problematic case for interventionism about causation. See Schaffer (2016a: 65) for acknowledgment of the complications with preemption cases. See Wilson (2016: 186–91) for further discussion.

5. Implications

If Unity, or at least Illumination, is correct, there are obvious upshots. Arguably, the upshots are most beneficial for defenders of grounding, given that causation is the more familiar and accepted theoretical posit. In fact, Schaffer (2016a: 91) takes his defense of Unity to constitute an argument for grounding monism, the view that there is a single relation of grounding. Grounding skeptics like Jessica Wilson (2014, 2016) and Koslicki (2015) accept only specific determination relations such as set formation and constitution. According to such skeptics, these relations are not instances or species of a more general grounding relation.

Unity is consistent with the view that there are many different grounding relations; however, Schaffer argues that just as the formalism of structural equations models unifies notions of causation, it also unifies notions of grounding. See also Schaffer (2016b: 166–67). Note that Trogdon (2018: 1292–93) is explicit that he is not arguing this. On the other hand, if Illumination and thus Unity are false, we cannot use causation as a starting point for theorizing about grounding, except to explain what it is not. While this would not entail grounding skepticism, it would take away an important resource for defenders of grounding.

Related Topics

Chapter 8: M. Glazier, "Ground and Explanation"
Chapter 10: A. Skiles, "Necessity"
Chapter 11: K. Koslicki, "Skeptical Doubts"
Chapter 13: K. Richardson, "Varieties"
Chapter 31: N. Emery, "Laws of Nature"

Notes

1   I am going to use the term "state-of-affairs" as a neutral stand-in (insofar as this is possible) for whatever the relata of grounding or causation are, with some exceptions. For a discussion of the relata of ground, see the introduction of this volume; for the relata of causation, see Schaffer (2016c).
2   Historical connections between causation and grounding-like notions deserve to be explored as well. As this task requires historical as well as philosophical expertise, I leave it to the relevant experts. See, for instance, Phil Corkum (2016), Katy Meadows (Forthcoming) and Benjamin Schnieder (2014), as well as Chapter 1 of this volume.
3   Trogdon discusses a potential complication, given that he leaves it open whether there are instances of grounding relations that are not grounding mechanisms; see his (2018: 1304–5).
4   She in fact holds that there is a family resemblance rather than a natural kind; see Chapter 3 of her book.

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