# 5 Causation Ex Nihilo: Could There Be Empty-Base *Causal* Explanations?

This chapter investigates the following questions that naturally arise when thinking about empty-base explanation and explanatory relations that allow for corresponding empty-base explanations such as grounding:

1. Does every explanatory relation allow for a corresponding kind of empty-base explanation?
2. In particular, is *empty-base causal explanation* (or what we might call *causation ex nihilo*) possible?
3. What is it about explanatory relations that does or does not allow for empty-base explanation?

Let me be a bit more explicit about what is meant by 'empty-base causal explanation'. I have in mind a kind of explanation featuring a causal analogue of zero-grounding that we may call 'zero-causation' or 'causation ex nihilo'. The idea of zero-causation can be understood analogously to zero-grounding, given a few assumptions about causation.[188] I will assume that causation can be expressed by a sentential operator; we will use '$\mapsto$' and assume that causal claims have the form 'Γ$\mapsto P$'. Here, '$P$' stands for the effect and 'Γ' for a plurality of causes that cause the effect. Then, we can define zero-causation claims as those causal claims in which 'Γ' stands for an empty plurality of causes. Suppose on the other hand that causation can be expressed by claims of the form '$ff$ cause $g$', which involve a two-place relational predicate 'cause' relating a plurality of causes to an effect, then zero-causation can be expressed either by a claim of that form where '$ff$' refers to the empty plurality of facts, or by claims of the form '$g$ is zero-caused' which involve a one-place predicate 'is zero-caused' that stands to 'cause' in a relation corresponding to the relation that 'is zero-grounded' stands to 'ground'.

For the purpose of this chapter, I will assume that the idea of zero-causation can be expressed in these ways. More specifically, I will assume the first formulation to work. This is not to say that these assumptions are trivial or uncontested; rather, I am interested in what can be said for and against the possibility of zero-causation assuming the expressibility of the idea. A preliminary clarification of the idea of zero-causation is in order: Like in the case of zero-grounding, the idea of zero-causation does not amount to that of a fact that can in some way be

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[188] In principle that is: Of course, if it turns out that something in the concept of causation prohibits zero-causation, it cannot be properly understood.

characterized as 'empty' causing something, or of *the nothing*, understood as some curious entity causing something – whatever exactly that may mean. More sensibly perhaps, one may think that facts like the fact that nothing (of a certain type) exists or facts according to which the amount of a certain physical quantity is zero can cause things.[189] This idea is distinct from the idea of zero-causation, which amounts to the idea of something being caused, but not being caused *by* anything. In this respect, again, the notion is analogous to the notion of zero-grounding.

The three questions above are not only interesting because answers to them would improve our understanding of the phenomenon of empty-base explanation, and because the availability of zero-causation would most likely have interesting philosophical applications, but also for the following reason: In principle, one might grant the possibility of zero-grounding explanation and other kinds of empty-base explanations like those that I discussed in the previous chapters, and still deny the possibility of other kinds of empty-base explanation such as zero-causation explanation. But, then, given that the arguments for the possibility of empty-base explanations such as zero-*grounding* explanation have to overcome some intuitive resistance, merely pointing out the counter-intuitiveness of zero-*causation* is insufficient. Rather, some sort of account is called for of the difference between the kinds of explanation that allow for empty-base explanation and those kinds of explanation that do not allow for it.

Alternatively, we could either deny the possibility of empty-base explanation in general, or we could accept the possibility of every kind of empty-base explanation including zero-causation. The former option would not exactly fit what this book is all about, and the latter option leaves us with the task of making the notion of zero-causation intelligible. It is to be expected that this issue gets more pressing the more similar one takes grounding and causation to be: If grounding were indeed a kind of causation – 'metaphysical causation' – as for example Wilson (2018) claims, it would be hard to see how zero-grounding could be possible without zero-causation being possible too.[190]

In the following I will take some steps towards answering the question whether zero-causation is possible and develop some ideas for answers to the other two questions above. In the end, the question of whether empty-base explanation by law of nature might be more tractable. In fact, as we will see below, a 'real-science' candidate (from Boltzmannian statistics to be precise) for what (in effect) amounts to an empty-base explanation of a part of concrete physical reality by statistical

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189 Thanks to Jonathan Schaffer for pointing out this idea to me.
190 For a response to Wilson's view see Bernstein (2016).

law of nature (and hence a potential corresponding answer why there is anything at all) has recently been identified by Hicks and Wilson (2021). But before we look at these issues more closely in section 5.2, let us warm up with a look at Litland's argument for the zero-grounding of non-factive grounding claims that will provide this chapter and the question whether every kind of explanation allows for a corresponding kind of empty-base explanation with some additional motivation.

## 5.1 Generalizing Litland's argument for zero-grounding of non-factive grounding facts?

Litland (2017) argues that non-factive grounding facts are zero-grounded. In this section I try to show that Litland's argument has an interesting yet potentially problematic feature: The argument is so general that it likely applies not only to grounding, but to other explanatory notions such as laws of nature and possibly causation as well; in any case, Litland does not provide reason to believe that his argument should not so generalize. Thus, let us now look at Litland's two considerations which he uses to motivate the zero-groundedness of non-factive grounding claims. The first is the metaphor of the machine that we have already encountered in chapter 2:

> Think of a machine generating truths from other truths. The machine is fed truths, churning out truths grounded in the truths it is fed. A truth is *ungrounded* if the machine never churns it out; a truth is *zero-grounded* if the machine churns it out when it is fed *no* input.
> In terms of this picture, why would the machine give the verdict that $\Delta \Rightarrow \phi$ is zero-grounded if true? Think of it like this. When the machine is fed no input the machine, instead of remaining idle, "simulates" the results of being fed various input. In simulating what happens when it is fed the propositions $\Delta$ the machine proceeds just as it would have if it in fact had been fed $\Delta$ as input. If, when running the simulation, the machine churns out $\phi$, the machine ends the simulation and churns out $\Delta \Rightarrow \phi$. Since the machine was fed no input this means that $\Delta \Rightarrow \phi$ is zero-grounded if true. (Litland 2017, 287)

At least *prima facie,* nothing in this consideration concerns features that are specific to grounding. Thus the question arises whether the same consideration extends to arbitrary kinds of explanatory links, for example laws of nature, or – perhaps more controversially – causation. In order for the consideration to generalize to other explanatory notions, it must be possible to make sense of corresponding non-factive notions. For laws of nature, this condition is fulfilled because laws of nature are presumably non-factive in general: From its being a law that for every $x$, if it is $F$, then it is $G$ too it does not follow that there is any $x$ that is $F$ or $G$.

The situation is different for causation and 'non-factive causal claims': Grounding (which allows for a non-factive notion) is much more modally stable than causation: First, causes often do not necessitate (with either metaphysical or natural necessity) their effects. For example, something might intervene in a nearby world that keeps the original cause from causing the effect. Second, causation seems to be an external notion in the sense that the existence in some non-actual world of something that is a cause and something that is an effect in the actual world does not guarantee that they are causally related in that other world: Again, an intervening factor might keep the original cause from causing the effect, but now a different cause may bring about the original effect. Therefore, there is some reason to doubt that causation is modally stable enough for a corresponding non-factive notion to exist.[191]

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[191] Cf. Kovacs (2022). Kovacs there raises the question of what causes causal claims. After having argued for the sensibility of the question, he considers several potential answers and finds them all lacking. For what it's worth, I find the following picture attractive: (Ordinary) instances of causation of a cause $C$ causing an effect $E$ are at least partially explained (in the capacity of reasons why) by the original cause $C$ (similar to how, on Bennett's and Litlands pictures, factive grounding claims are grounded in the involved grounds). If we assume this to be causation (as Kovacs considers), we can solve Kovacs' challenge from the externality of causation: He dismisses the idea on the basis that causation is external: From $C$ actually causing $E$ it does not follow that necessarily, if $C$ and $E$ exist, $C$ causes $E$. But pace Kovacs, the externality of causation is unproblematic, if not helpful here: Our proposal is that if $C$ causes $E$, then $C$'s causing $E$ is caused by $C$ too. Now, because of the externality of causation, it is possible for $C$ and $E$ to be present without $C$ causing $E$. Hence in these situations, $C$ cannot cause $C$'s causing $E$. But since causation is an external notion, our proposal predicts no such thing and we can hold that $C$ only causes $C$'s causing $E$ if $C$ causes $E$.

So perhaps Kovacs' idea was that since causation is external, for every $C$ and $E$, if $C$ causes $E$ it must be possible that $C$ and $E$ obtain without $C$ causing $E$, but it is unclear why we should subscribe to this stronger form of the principle. The following kind of case counts in favor of only accepting the weaker understanding of externality: If I see an event occur and on that basis form knowledge that the event occurred, then presumably, the event has caused my knowing (or coming to know) that the event occurred. But my coming to know that the event occurred could not have obtained without the occurrence of the event.

A proper investigation of the matter will further have to address the role of laws of nature, powers, or dispositions. One idea to consider here is that they are further reasons why instances of causation obtain. Similar to how the grounds need to work together with non-factive grounding claims to ground factive grounding claims on Litland's picture, causes would then work together with (e.g.) laws of nature to cause (or otherwise explain in the capacity of reasons why) their causing their effects. Depending on the details, we might even obtain the result that instances of causation are fully explained by their causes, if we assume that laws of nature are empty-base explained.

Nevertheless, I will assume that in analogy to non-factive grounding, it is sensible to talk of non-factive causation. We will express non-factive causal claims using the operator '$\Rightarrow_c$', and we will assume that they have the form 'Γ$\Rightarrow_c$P'. While I will continue to primarily talk about zero-causation and non-factive causal claims, it must be stressed that we can sidestep the above problems and alternatively understand the following to concern laws of nature rather than non-factive causal claims by letting '$\Rightarrow_c$' express a connection of law of nature and assume that laws of nature can have the form 'Γ$\Rightarrow_c$P'. First, it would already be remarkable if Litland's argument generalized to laws of nature. Second, because laws of nature and causation are arguably systematically related, this would raise the question whether instances of causation correspond to zero-instances (or empty-base instances) of laws of nature.

Coming back to Litland's metaphor of the explanatory machine: Where and why, if at all, does the following consideration go awry, which has been obtained from Litland's by substituting talk of (zero-)causation for talk of (zero-)grounding (I use fact-talk instead of proposition-talk because it fits causation more naturally than truth-talk):

> Think of a machine generating facts from other facts. The machine is fed facts, churning out facts caused by facts the machine is fed. A fact is *uncaused* if the machine never churns it out; a truth is *zero-caused* if the machine churns it out when it is fed *no* input.
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> In terms of this picture, why would the machine give the verdict that 'Δ$\Rightarrow_c\phi$' is zero-caused if it obtains? Think of it like this. When the machine is fed no input the machine, instead of remaining idle, "simulates" the results of being fed various input. In simulating what happens when it is fed the facts Δ the machine proceeds just as it would have if it in fact had been fed Δ as input. If, when running the simulation, the machine churns out $\phi$, the machine ends the simulation and churns out 'Δ$\mapsto\phi$'. Since the machine was fed no input this means that 'Δ$\mapsto\phi$' is zero-caused if it obtains.

One possible response would be to argue that causation facts cannot themselves be caused – perhaps, by their or causation's nature, they are not apt to be caused – and hence that the consideration *must* fail somewhere (but see Kovacs (2022) who argues against this idea). I want to consider two reactions to this: First, it not obvious whether the same move is available for the case of laws of nature, which would have to be done to analogously explain why the following law-employing version of Litland's consideration fails:

> Think of a machine generating truths from other truths. The machine is fed truths, churning out truths explained by laws of nature and the truths the machine is fed. A truth is *not explained by a law of nature* if the machine never churns it out; a truth is *empty-base natural-law-explained* if the machine churns it out when it is fed *no* input.
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> In terms of this picture, why would the machine give the verdict that 'It is a law of nature that Δ → $\phi$' is empty-base natural-law-explained if true? Think of it like this. When

the machine is fed no input the machine, instead of remaining idle, "simulates" the results of being fed various input. In simulating what happens when it is fed the propositions $\Delta$ the machine proceeds just as it would have if it in fact had been fed $\Delta$ as input. If, when running the simulation, the machine churns out $\phi$, the machine ends the simulation and churns out 'It is a law of nature that $\Delta \rightarrow \phi$'. Since the machine was fed no input this means that 'It is a law of nature that $\Delta \rightarrow \phi$' is empty-base natural-law-explained if true.[192]

Second, instead of considering specific explanatory notions such as grounding, causation, and laws of nature, it seems that we can formulate the metaphor of the machine for because-claims in general. To this end, let us assume that there is a non-factive variant of 'because', which we will express with 'because$_{NF}$'. Further, recall from chapter 1 the sense of 'explains' in which it mirrors 'because': [*P*] explains$_B$ [*Q*] in this sense iff *Q* because *P*. Using 'explains$_B$' to express this notion, we can get the following final variant of Litland's story:

> Think of a machine generating truths from other truths. The machine is fed truths, churning out truths explained by the truths it is fed. A truth is unexplained if the machine never churns it out; a truth is empty-base explained if the machine churns it out when it is fed *no* input.
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> In terms of this picture, why would the machine give the verdict that [$\phi$ because$_{NF}$ $\psi$] is empty-base explained if true? Think of it like this. When the machine is fed no input the machine, instead of remaining idle, "simulates" the results of being fed various input. In simulating what happens when it is fed the proposition $\psi$ the machine proceeds just as it would have if it in fact had been fed $\psi$ as input. If, when running the simulation, the machine churns out $\phi$, the machine ends the simulation and churns out [$\phi$ because$_{NF}$ $\psi$]. Since the machine was fed no input this means that [$\phi$ because$_{NF}$ $\psi$] is empty-base explained if true.

It would be quite remarkable if Litland's argument would generalize to all (non-factive) because-claims in this fashion, yet it is not easy to see why it would not so generalize, unless we turn to the lack of modal stability again.

Now, let us turn to Litland's second consideration in favor of the zero-grounding of non-factive grounding statements. If it did not generalize to explanatory notions other than grounding, Litland could claim that it provides the crucial argument for the zero-grounding of non-factive grounding statements and thereby avoid the problem of overgeneralization. Litland's second consideration is based on his calculus for explanatory arguments and especially his introduction rule for '$\Rightarrow$'. Alas, none of the rules seem to deal on any feature special to grounding as opposed to say, explanation by law of nature. To see this, let us go

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**192** If explanation involving laws of nature appears to you to more naturally involve facts than propositions, just make the relevant substitutions above. This does not seem to affect the appeal, whatever it may be, of the consideration.

through the rules (to be found in Litland 2017, 292ff.): INCLUSION, ASSUMPTION, NON-CIRCULARITY, and PLAIN CHAINING either concern arguments in general, or they clearly generalize from explanatory arguments that involve grounding to explanatory arguments that involve causation or other explanatory notions.

Perhaps, some may doubt NON-CIRCULARITY, for example on the basis of a potential case that there could be causal loops and hence valid circular causal explanatory arguments, while grounding loops are impossible. But for our purpose this is irrelevant because the argument for the zero-grounding of non-factive grounding does not involve NON-CIRCULARITY. Whether the argument generalizes to other explanatory notions thus does not depend on whether NON-CIRCULARITY does so generalize. The same holds for the rule CHAINING, which corresponds to the transitivity of the explanatory notions involved in the corresponding arguments: Perhaps transitivity fails for some explanatory notions such as causation, or perhaps 'because' is not transitive, while grounding is, but this would be irrelevant for our purpose because the argument that we consider does not involve CHAINING. In fact, for our purpose we only need to look at the following rule (Litland 2017, 297):

Given this rule, it can be shown that starting from an explanatory (grounding) argument, an explanatory argument from zero premises for the corresponding non-factive grounding claim can be constructed, and that from this resulting explanatory argument, an explanatory argument from zero premises for the conclusion that said non-factive grounding claim is non-factively zero-grounded can be constructed (see Litland 2017, 297). Given the further rule ⇒-Introduction (Litland 2017, 298), the argument can be extended to an argument from zero premises to the conclusion that the non-factive grounding claim in question is also *factively* zero-grounded. ⇒-Introduction plausibly generalizes to other explanatory notions (given that they support the distinction between factive and non-factive, which is an assumption that we have made above).

Litland requires further rules to construct arguments that start with an arbitrary non-factive grounding statement and derive from this that it is zero-grounded. But for our purpose we can focus solely on ⇒-Introduction: At least assuming the existence of non-factive causation claims, it seems plausible that there are explanatory causal arguments and indeed it also seems plausible that every causal explanation then corresponds to such an argument. Thus if ⇒-Introduction generalizes to (non-factive) causation, those arguments can be extended to arguments that show that the corresponding non-factive causal claims are zero-caused. Something analogous seems to hold for other explanatory notions and the generic 'because'.

So let us turn to what Litland says in favor of the crucial rule ⇒-Introduction:

> The only reasonable alternative view would require more than an explanatory argument $E$ from $\Delta$ to $\phi$ in order to allow us to conclude $\Delta \Rightarrow \phi$. The alternative view would, in addition, require the premiss that $E$ is explanatory. (If one adopted such a view the question would naturally arise what grounds the truth *that $E$ is explanatory*.)
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> We should resist this view. What is needed to conclude $\Delta \Rightarrow \phi$ is just an explanatory argument $E$ from $\Delta$ to $\phi$; there is no need for the further truth that $E$ is explanatory. The requirement that we need this further truth is as inappropriate as the demand that in order to apply conditional proof we need not just a valid argument $D$ from $\phi$ (and some further premisses) to $\psi$, we need, in addition, the premiss that $D$ is valid. It might be helpful to think about this in terms of the machine picture.
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> To determine whether $\Delta \Rightarrow \phi$ we go to a machine that encodes every explanatory inference. We then ask the machine to simulate the result of being fed input $\Delta$. The machine then procedes [sic] to run the simulation. If the machine churns out $\phi$ it also churns out $\Delta \Rightarrow \phi$ and ends the simulation. At no step in this process is it necessary for the machine to check whether the inferences it carried out were explanatory. (Litland 2017, 297)

As far as I can see, there are two considerations here: First, once more, the metaphor of the machine that I have already addressed seems to generalize to other explanatory notions; at least it is unclear why it should not do so. Second, the idea that an alternative to $\Rightarrow$-Introduction would have to require as an additional premise the claim that the argument in question is explanatory, which, according to Litland, would be just as inappropriate as to require an additional premise of validity in applications of conditional proof.

*If* this consideration is convincing, I do not see why it should not generalize to other explanatory notions. Again, a problem for the generalization to causation could be that non-factive causation facts might not be the right thing to be caused (see also below). Yet, if the generalization extends to the generic 'because$_{NF}$', instances of the generic 'because$_{NF}$' that correspond to instances of causation would be empty-base explained, albeit not empty-base *causally* explained. However, it is unclear how convincing Litland's consideration is in the first place: Even if we suppose that the analogy with conditional proof holds, are there not other candidates for supplementary premises that an alternative to $\Rightarrow$-Introduction could require? For example, Dasgupta (2014b) effectively suggests that non-factive grounding claims are grounded in certain essences. What Litland says does not seem to fully address such a rival proposal. Lastly, perhaps the raw intuitive appeal of $\Rightarrow$-Introduction is stronger than that of its analogues for laws of nature, causation, etc. But, first, I cannot find that it is, and, second, it would be unsatisfactory if this were the only disanalogy between the cases.

Given these considerations, the situation concerning Litland's argument is this: First, in any case, one might think that even if non-factive grounding is zero-grounded, however this is established, this result should not stand or fall with other explanatory links being zero-explained or not – at least one might have

thought that this latter result cannot be as easily established as can be done with Litland's argument, if it is successful. Second, the following dilemma arises for proponents of Litland's consideration: The first horn consists in the challenge to point out where Litland's consideration holds for grounding but fails for other kinds of explanatory links, for example causation. The second horn consists in accepting the conclusion that every true non-factive explanatory link (and every true non-factive because-claim) is empty-base explained.

So maybe Litland's two considerations should not be conceived as arguments on their own for the thesis that non-factive grounding facts are zero-grounded and more as a kind of aid to make sense of the zero-groundedness of non-factive grounding facts. In that case, the required additional reasons to accept the thesis could perhaps be provided by the neatness of the thesis as a solution to the question of what grounds grounding, and by its theoretical utility and potential to solve the 'status problem'.[193] Indeed, further arguments for the thesis may be possible, for example Krämer (manuscript) investigates the grounds of ground using Fine's (2017a, 2017b) truthmaker semantics, and obtains the result that given plausible assumptions, non-factive grounding claims may well be zero-grounded, without giving rise to a problem of overgeneralization.

Setting aside Krämer's idea and focusing on Litland, a problem arises even if we assume that the alternative interpretation of the proposal from the previous paragraph is correct: First, it would presumably be equally neat (if not neater) to assume that other non-factive explanatory links are empty-base explained as well. Furthermore, surely theoretical advantages of such a thesis could be found; to give an example that comes to mind, a sort of Humean may welcome the thesis that no law of nature remains unexplained, given the assumption that all laws of nature are empty-base explained. But then the question arises whether Litland's considerations can help to make sense of the empty-base explanation of, e.g., causal explanatory links or laws of nature. If they can, it once again appears that his argument generalizes to these kinds of explanations as well. If we assume that his considerations cannot, the question is what it is that differentiates the cases in which Litland's considerations work from those in which they do not.

To explain this further, assume that going through Litland's consideration is supposed to help make sense of the zero-groundedness of non-factive grounding facts. As I have argued above, we can go through Litland's consideration with laws of nature, non-factive causation (if there is such a thing), or a general non-factive 'because' in mind instead of grounding, without it being clear whether and at what point these analogous considerations fail. But if we assume that one of the

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**193** Litland (2017, 283ff.).

analogous considerations fails, it seems Litland's original consideration concerning grounding does not provide enough to make sense of the zero-groundedness of non-factive grounding facts – it remains unclear why the consideration should go through for grounding, but not for laws of nature, non-factive causation, or a non-factive general 'because'.

To approach the thought of other explanatory links also being empty-base explained, two thoughts come to mind: First, there is the question whether conditions of candidacy for empty-base explainability can be identified.[194] Second, note that given the assumption that all (non-factive) explanatory links are empty-base explained, it does not (obviously) follow that laws of nature or (non-factive) causal links are zero-*caused* (or consequents of laws of nature with an empty antecedent). This is because the latter might in principle be empty-base explained in a different, non-causal way; they might for example be zero-*grounded*. In any case an explanatory notion would be required that figures in the link of the relevant empty-base explanations. Causation may not be a good candidate: (non-factive) causal links may not be the right kind of fact to be caused, or zero-causation may be impossible in general.

But metaphysical grounding does not appear to be a good candidate either: First, (non-factive) causal links do not have the intuitive air of insubstantiality around them that zero-grounded facts could be thought to possess. Second, at least if we accept that $[\Gamma \Rightarrow P]$ entails $[\Box(\Gamma \rightarrow P)]$, then all zero-grounded facts obtain with metaphysical necessity – but we would not want to accept that (non-factive) causal links obtain with metaphysical necessity, at least not on the basis of Litland's considerations about the grounds of grounding. More plausibly, (non-factive) causal links obtain with natural necessity, which would resonate with the idea that the kind of link involved in empty-base explanations of (non-factive) causal links is a law of nature or involves natural grounding.

We will leave the discussion of Litland's considerations at this and instead pursue our question from the introduction that has just reoccurred: Is zero-causation possible, and if not, why not?

## 5.2 Is zero-causation possible?

In order to defend the possibility of zero-causation, one could attempt the kind of strategy that Fine uses with zero-grounding and the empty conjunction: As we have seen in chapter 2, Fine takes a general principle of grounding, namely the

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194 For a look at this question from an epistemological angle see chapter 7.

principle that the conjuncts of a true conjunction together ground the conjunction, and argues that the principle has a limiting instance, namely the empty conjunction and its zero conjuncts, from which an instance of grounding with an empty set of grounds – an instance of zero-grounding – follows. Correspondingly, for the case of zero-causation, one could try to find a general principle of causation (or perhaps a corresponding law of nature) for which there is an instance involving an effect and an empty set of causes. Alas, I do not know of any such principle.[195]

On the other hand, arguing that zero-causation is *im*possible is not straightforward either: While it could be thought to be an obvious, perhaps conceptual, truth that for every effect (viz. for everything that is caused) there is a cause, such considerations – if they remain unsupported by further argument – are unavailable once the possibility of empty-base explanation (and zero-grounding in particular) has been granted. After all, one could have easily thought it obvious or conceptually true that whenever something is grounded, it must have grounds or that whenever there is an explanation why there must also be reasons why – but these assumptions are false given the possibility of zero-grounding and empty-base explanation which we presuppose here.

Nevertheless, in order to find out whether zero-causation is possible, we can try to take a closer look at accounts of causation to see whether there is anything in the nature of causation that makes zero-causation impossible (or perhaps possible – depending on what we find). Furthermore, the friend of zero-grounding and empty-base explanation in general will want to make sure that if there is a feature of causation that makes zero-causation impossible, nothing like this feature is shared by grounding or explanation in general. In this vein, in the next subsection I will take a look at the form of causal principles, and in the following subsection I will look at the connection between causation on the one hand and causal powers and dispositions on the other, and compare it to the connection between grounding and essence.

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**195** A natural starting point when searching for candidates for zero-causation should be found in cosmology, it strikes me: Theories of first events or the beginning of time appear to be what should be looked at here. Hicks and Wilson (2021) may have identified a candidate: In their paper, they argue that statements of probability (or, better, I think: probabilistic/statistical laws of nature) play the role of higher-order reason in explanation. In the end, they float the idea of null-explanation by probability (which is (in effect) a kind of empty-base explanation and almost what I propose for explanation by high probability in chapter 3) as a kind of explanation for why there is anything at all. Most intriguingly, they suggest on the basis of Demarest (2016) that Boltzmannian statistics might give rise to such null-explanations.

What follows is not a comprehensive study of how different accounts of the nature of causation bear on the possibility of zero-causation. For example, one could further think about whether the temporal nature of causation has consequences for the possibility of zero-causation, or one could systematically look at accounts of causation in the literature to see whether they provide room for zero-causation.[196] Here, I am content with providing an initial exploration into how the two aspects of the nature of causation mentioned might bear on the possibility of zero-causation.

### 5.2.1 Explanation by law of nature and general principles

If empty-base explanation by law of nature is possible, then given the close connection between causation and laws of nature, at least some of those explanations might correspond to instances of zero-causation. Indeed, Hicks and Wilson (2021) have recently identified a real science candidate for an empty-base explanation of the first event of the universe that I will present now.

Some background is required: Albert's and Loewer's *mentaculus* involving Boltzmannian statistical mechanics is brought forward as a framework to "explain the second law of thermodynamics, various arrows of time, and [to formulate] a complete scientific theory of the universe" (cf. Loewer forthcoming). It consists of the following ingredients:

1.  fundamental dynamical laws that describe the evolution of the fundamental microstates of the universe,
2.  the Past Hypothesis: a boundary condition characterization of the macro state $M(0)$ of the universe at its beginning,
3.  Statistical Postulate: there is a uniform probability distribution specified by the standard Lebesgue measure over the physically possible microstates that realize $M(0)$.

Demarest (2016) suggests that the coming about of the microstate realizing $M(0)$ is an initial chance event. It is not caused by another event, but there was an objective probability that it obtain, and this this chance is captured by the laws of the mentaculus. Now, Hicks and Wilson (2021) suggest in effect (but using slightly different terminology) that these laws afford an explanation by status of the

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**196** One kind of account that comes to mind is that of mark transmission accounts like that developed in Salmon (1984), according to which causation involves transmissions of a certain kind of change in features ('marks'). With respect to zero-causation, *prima facie,* such accounts give rise to the question what should be transmitted from where in an instance of zero-causation.

initial microstate of the universe involving a probabilistic law of nature. So assuming that the mentaculus picture is correct, why would the initial microstate of the universe obtain then? *Just because!*[197]

Further investigation is required to discern what exactly the form of the laws involved in the candidate explanation above is. In general, the possibility of empty-base explanation by laws of nature and by extension zero-causation depends on what form laws of nature can in general have. For example, consider the following core of Woodward's interventionist theory for causal explanation and what form the general principles have according to it:

> Suppose that $M$ is an explanandum consisting in the statement that some variable $Y$ takes the particular value $y$. Then an explanans $E$ for $M$ will consist of (a) a generalization $G$ relating changes in the value(s) of a variable $X$ (where $X$ may itself be a vector or $n$-tuple of variables $X_i$) and changes in $Y$, and (b) a statement (of initial or boundary conditions) that the variable $X$ takes the particular value $x$. A necessary and sufficient condition for $E$ to be (minimally) explanatory with respect to $M$ is that (i) $E$ and $M$ be true or approximately so; (ii) according to $G$, $Y$ takes the value $y$ under an intervention in which $X$ takes the value $x$; (iii) there is some intervention that changes the value of $X$ from $x$ to $x'$ where $x \neq x'$, with $G$ correctly describing the value $y'$ that $Y$ would assume under this intervention, where $y' \neq y$. (Woodward 2003, 203)

Suppose for the sake of argument that the general principles that underlie causation in this way have the following law-form: '$\Box_N \forall x(Fx \rightarrow Gx)$'. Let us further assume that the instances of this law would then correspond to non-factive causal links of form '$Fa \Rightarrow_C Ga$'. But then no non-factive causal link seems to have the form required for zero-causation, that is '$T \Rightarrow_C P$', where 'T' stands for an empty plurality of facts!

In defense of the possibility of zero-causation, at least two issues with this train of thought can be identified: First, it is not quite clear what the argument is that establishes that general principles of the relevant form have to underlie causation. Second, with enough conceptual flexibility, the conclusion might not follow: Consider the lambda-operator applied to a closed sentence: '$\lambda x(P)$'. Applied to '$a$' this delivers '$P$'. Suppose we can extend the applicability of the lambda-operator to sets of sentences, especially to the empty set of sentences. Now consider the following law: $[\Box_N \forall x((\lambda y \Gamma)x \rightarrow Gx)]$. This arguably has the form '$\Box_N \forall x(Fx \rightarrow Gx)$'. But if $[\Box_N \forall x((\lambda y \Gamma)x \rightarrow Gx)]$ is true, $[\Box_N \forall x(\Gamma \rightarrow Gx)]$ is plausibly true as well and vice versa – but the latter is a law that plausibly can underlie $[\Gamma \Rightarrow_C P]$.

In future research I suggest we look at further forms laws of nature might take (for example, we should look at sententially (plural) quantification and sentential

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**197** Whether we may furthermore call this *causation ex nihilo* depends on (among other things) the relation between causation and laws of nature.

operators both of which contribute to the existence of zero-instances of principles of ground), investigate whether they allow for empty-base instances, and then apply the findings to candidate cases like Hicks and Wilson's, or come up with toy cases and scenarios in which those laws would intuitively provide empty-base explanations (by law of nature). In this way, the intelligibility of empty-base explanation by (generalized) laws of nature could be further supported.

Let us take some first steps into this direction.[198] This is (one version of) the grounding schema for generalized conjunction:

$$\Gamma < \Lambda(\Gamma)$$

The notion of generalized conjunction allows the conjunction of sets of propositions. In particular, it allows to form the empty conjunction, which is grounded in its zero conjuncts. The following is a candidate for the corresponding metaphysical law. Let '$\blacksquare$' express the relevant law status and let '$\rightarrow$' express a version of the material conditional that may be combined with a (possibly empty) plurality of sentences on its left-hand side and one sentence on its right-hand side, and let the corresponding conditional sentence be true iff at least one of its antecedent sentences is false or its consequent sentence is true. Thus if there is no antecedent sentence, it is true iff the conditional's consequent sentence is true. Furthermore, allow the plural sentential quantification to quantify over the empty plurality:

$$\blacksquare \forall pp(pp \rightarrow \Lambda(pp))$$

Laws of nature are sometimes assumed to have a quantified conditional form like this:

$$\blacksquare \forall x(Fx \rightarrow Gx)$$

But as with Woodward's more concrete interventionalist principles, it seems that laws like this cannot have the required edge case: Every instance of this schema is such that the antecedent of the embedded conditional involves predicating *F* of something, so no instance can correspond to an explanation whose base is empty. This point arguably remains even if we consider plurally quantified laws and allow for quantification over the empty plurality of entities, i.e. like this:

$$\blacksquare \forall xx(Fxx \rightarrow Gxx)$$

Here too, the antecedent of the embedded conditional of the instance using the empty plurality of entities would still predicate something of the empty plurality

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and hence not afford an empty-base explanation. But now consider the form of the metaphysical law for the generalized conjunction. By using '$O()$' as a place-holder for a sentential operator that can take (a possibly empty) plurality of sentences as an argument, we can obtain the following more general form:

$$\blacksquare \forall pp(pp \rightarrow O(pp))$$

Some questions that arise then are whether there are possible candidates for laws of nature that have this form, whether the example of Hicks and Wilson (2021) can be formulated in such a form, and whether there are (toy) scenarios in which laws of nature like this intuitively seem to provide explanations. In principle, by describing such laws of nature and corresponding scenarios, a case could be made for the intelligibility of the idea of empty-base explanation involving laws of nature.[199]

Before we leave this strand of thought to further research, let me point out a potential challenge: What differentiates laws of natures from laws of metaphysics (aside from, arguably, their modal strength) is perhaps unclear, but one might be particularly interested in finding out whether empty-base explanation could be afforded by laws with the *diachronic* character that laws of nature often seem to have: They link goings-on at some point in time to goings-on at a later point in time and thereby help explain the latter in terms of the former. Diachronicity is also often mentioned as an aspect that helps to distinguish causation from grounding. Thus, insofar as we are interested in the intelligibility of causation ex nihilo, it seems apt to try to identify candidates for laws with a diachronic character.

### 5.2.2 Causal powers, dispositions, and essences

According to some, causation involves manifestation of causal powers. For example, according to Mumford and Anjum (2011, 7), "[effects] are brought about by powers manifesting themselves". Furthermore, it is plausible to believe that the causal powers that are manifested in an instance of causation 'belong' – in a certain sense – to the cause in question or an entity that figures in it. For example: Suppose $x$'s joking causes $y$ to blush. According to the idea just alluded to, there must be a causal power involved that belongs to $x$ or $x$'s joking – namely a power to make things (or $y$ in particular, or things like $y$) blush ('in the relevant circumstances' may have to be

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[199] While the example of Hicks and Wilson (2021) claims some actual plausibility, we should distinguish looking for candidates for laws of nature that could be (for all that we know) actual from candidates that could be laws of nature in some conceivable scenario. The latter would be sufficient to establish the conceivability of empty-base explanation by law of nature.

added). Now this thought might provide us with a reason to believe that zero-causation is impossible: According to the idea just sketched, for there to be causation, there must be causes (or constituents of causes) that bear causal powers. But the hypothetical case of zero-causation does not involve causes and thus does not involve anything that could bear the required powers.

Let us compare this with the case of grounding: While grounding does not bear a connection to powers like causation does (at least no such connection has been discussed in the literature, as far as I know), the relation that grounding bears to *essence* is somewhat similar to the relation that causation bears to causal powers. But there is one crucial difference: While – per our assumption – causal powers associated with an instance of causation belong to the causing fact or some of its constituents, the essence that corresponds to cases of grounding belongs to the groundee or some of its constituents.

While there are many possibilities how to exactly spell out the connection between grounding and essence that can be roughly stated like this, some such connection is widely assumed. It can be supported by intuition, the fact that it might allow for the unification of the two notions (or at least mutual elucidation), and the idea that relations *like* grounding that have different connections to essence are therefore just that: grounding-*like* relations that are not the kind of grounding that we talk about[200] Thus, for zero-grounding, no analogous problem to that of powers for zero-causation arises, because the connection between grounding and essence does not require the essence that corresponds to an instance of grounding to belong to a corresponding ground or constituent thereof. Instead, the connection requires an essence that corresponds to a groundee or constituent thereof. Hence, the connection between grounding and essence does not require each instance of grounding to involve a ground and thereby leaves room for zero-grounding.

To put the difference between grounding and causation suggested here into a slogan: Causation is a *bottom-up* or *upwards* explanatory relation, while grounding is a *top-down* or *downwards* explanatory relation. The more general conjecture to emerge here then is this:

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**200** For references and more discussion of the connection between grounding and essence, and grounding-like relations (such as metaphysical causation perhaps) that bear different relations to essence see chapter 4.5.

**(Conjecture)**
Downwards explanatory relations allow for corresponding empty-base explana-
tions, but upwards explanatory relations do not allow for corresponding empty-
base explanations.[201]

So how could the friend of zero-causation attempt to deal with this train of
thought? First, of course, the connection between causation and causal powers
that I have assumed can be reconsidered. In fact, according to another idea, cau-
sation is closely related to dispositions. For example, according to this strand of
thought, the causal relation between Moriarty's throwing the ball at the window
and the window's breaking bears some interesting relation to the window's dispo-
sition to break. The thought the friend of zero-causation might then try to develop
is that perhaps instances of causation do not require a power that is associated
with a cause, but merely a disposition associated with the effect.

Second, at this point, we have already been quite (some would perhaps con-
sider this to be an understatement) conceptually liberal and permissive in allowing
zero-grounding and empty-base explanation: Can perhaps a little more permissive-
ness of this kind help the friend of zero-causation? Well, in a theoretical setting
where we have already accepted grounding without grounds, explanation why
without reasons why, and where we are (more or less seriously) contemplating cau-
sation without causes, the friend of zero-causation might be encouraged to go just a
little further and propose the existence of powers of the empty set of causes.

Recall here the idea that was floated at the end of the previous chapter, ac-
cording to which logical theorems such as $[P \lor \neg P]$ are empty-base explained and
the corresponding explanatory links are part of the essence of the empty set of
propositions or facts (or part of the alethic essence of the empty plurality of prop-
ositions). The relevant explanatory notion would provide further candidates for
an 'upwards explanatory relation' that can figure in a corresponding empty-base
explanation. If such an explanatory relation exists, the above conjecture that
downwards explanatory relations allow for corresponding empty-base explana-
tions, but upwards explanatory relations do not allow for corresponding empty-
base explanations, would fail. But, of course, it could still be argued that the kind
of empty-base explanation of logical theorems proposed here is possible (because
the required essential truths obtain, i.e. the empty set of propositions has a suit-
able essence), while zero-causation is impossible (because the required causal
powers cannot exist, i.e. the empty set of causes cannot be associated with any
causal powers).

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**201**  Note that, as we have seen in chapter 4, this distinction may not be exhaustive.

We are here confronted with the following problem: It is somewhat hard to see how conceptually and metaphysically permissive we should be; the question is how far we can go without – well – losing it. Aside from taking seriously intuitions about understanding why (as I will argue in chapter 7 we must), and taking as a constraint the existence of general principles or laws that generate empty-base instances, one answer presumably lies in trying to put the permissive apparatus to the test – if it allows for fruitful and interesting theorizing, it earns its keep; if it does not, then either it was a mistake to allow for it, or it does not really matter in any case, as long as we do not continue to try theorizing using the apparatus. With respect to zero-causation, perhaps the following then is the lesson to be drawn from the considerations above: Zero-causation may be (at least conceptually) possible, but examples and concrete applications would have to be investigated to take the idea seriously.

As already mentioned above, one intriguing direction for investigation here has been identified by Hicks and Wilson (2021). According to them (and based on the discussion of Demarest 2016 they rely on), Boltzmannian statistics does, in effect, generate a statistical empty-base explanation of part of concrete physical reality. Moreover, given what I have said above concerning the relationship between empty-base explanation and the question of why there is anything, the resulting explanation would be a candidate for an empty-base explanation of why there is anything at all by statistical law of nature.

In future research, one could attempt to extend insights from Litland and Haderlie's (manuscript) zero-grounding-friendly account of metaphysical laws to the case of laws of nature to investigate both the mentaculus explanation of the initial event of the universe and the possibility of empty-base explanation by law of nature and causation more closely.