


ARTICLE

Is knowledge of causes sufficient for understanding?

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ABSTRACT

According to a traditional account, understanding why X occurred is equivalent to knowing that X was caused by Y. This paper defends the account against a major objection, viz., knowing-that is not sufficient for understanding-why, for understanding-why requires a kind of grasp while knowledge-that does not. I discuss two accounts of grasp in recent literature and argue that if either is true, then knowing that X was caused by Y entails at least a rudimentary understanding of why X occurred. If my defense is successful, it would cast doubt on an influential account of the epistemic value of understanding.

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1. Introduction

It seems that we desire understanding more than mere knowledge. For instance, we are not satisfied with merely knowing that there is a change of seasons, that humans cannot survive without water, that Napoleon failed to conquer Russia in 1812, etc. We also want to understand why there is a change of seasons, why humans cannot survive without water, why Napoleon failed to conquer Russia in 1812, etc.

However, it has been widely held that understanding why something is the case is essentially a kind of knowledge: knowledge of causes. For example, Lipton (2004: 30) writes, 'Understanding is not some sort of super-knowledge, but simply more knowledge: knowledge of causes.' Specifically, understanding why X occurred is knowing why X occurred, where knowing why X occurred is equivalent to knowing that X was caused by Y. Thus understanding why X occurred is equivalent to knowing that X was caused by Y. Clearly, knowing that X was caused by Y is more than knowing that X is the case. So understanding is more knowledge. But anyway, on this view, understanding-why can be reduced to knowing-that. Let's call this view the 'propositional knowledge account of understanding.' Contemporary philosophers who endorse this account in

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varying levels of explicitness include Achinstein (1983), Kitcher (1985), Lipton (2004), Salmon (1984), Woodward (2003), and so on.

Recently, the propositional knowledge account of understanding has been challenged by several eminent philosophers, such as Elgin (2004, 2009), Grimm (2006); Grimm (2014), Hills (2009, 2015), Kvanvig (2003), Pritchard (2010, 2014), and Zagzebski (2001). They argue either that knowing-that is not sufficient for understanding-why (i.e., one who knows that X was caused by Y might still fail to understand why X occurred), or that knowing-that is not necessary for understanding-why (i.e., one who understands why X occurred might fail to know that X was caused by Y).

In this paper, I want to defend the sufficiency thesis of the propositional knowledge account of understanding, namely, knowing-that is sufficient for understanding-why.¹ First, I will briefly introduce the major objections to the sufficiency thesis in recent literature. Then I will defend the sufficiency thesis against these objections. Finally, I will discuss an implication of my defense: if the sufficiency thesis is true, it casts doubt on an influential account of the epistemic value of understanding.

2. Objections to the sufficiency thesis

Objections to the sufficiency thesis in recent literature share a common structure:

- (1) Understanding why X occurred requires U, that is, one cannot have any understanding without having U.
- (2) Knowledge that X was caused by Y does not require U, that is, one might have knowledge without having U.
- (3) Hence, one might know that X was caused by Y without having any understanding why X occurred.

Philosophers disagree on the nature of U. In what follows, I will discuss two views: (a) U is having a conception of how X might be caused by Y; (b) U is having a grasp of how X and Y are causally related.

Let us begin with (a), which is proposed by Pritchard (2010). He provides the following case to illustrate his point:

Suppose that I understand why my house burned down, know why it burned down, and also know that it burned down because of faulty wiring. Imagine further that my young son asks me why his house burned down and I tell him. He has no conception of how faulty wiring might cause a fire, so we could hardly imagine that merely knowing this much suffices to afford him understanding of why his house burned down. Nevertheless, he surely does know that his house burned down because of faulty wiring, and thus also knows why his house burned down. (Pritchard 2010: 81)

Here Pritchard thinks that one might know that X was caused by Y via testimony but have no conception of how X might be caused by Y. But if one has no conception of how X might be caused by Y, one does not understand why X is the case. So knowledge is not sufficient for understanding.

Some philosophers find implausible the claim that one might know that X was caused by Y without having any conception of how X might be caused by Y, however. For example, Grimm (2014) argues that if one has no conception of how X might be caused by Y, one cannot know that X was caused by Y simply because one cannot genuinely believe that X was caused by Y. Specifically, what Pritchard means by 'my son has no conception of how faulty wiring might cause a fire' seems to be that 'my' son simply assents to the causal proposition relayed by 'me' but then cognitively leaves it at that. There are two possible ways of how 'my' son simply assents to the causal proposition according to Grimm (2014: 337–338):

[My son] might simply be accepting the information as a parrot might – ready to repeat it, but without really grasping what is being said (or being repeated). Or again, it might be thought that what my son is assenting to is not the proposition that my house burned down because of the faulty wiring but rather a "nearby" proposition, such as that whatever the fire chief just said is true.

In either way, Grimm concludes, 'my' son would not genuinely know that 'my' house burned down because of faulty wiring for the simple reason that he would not genuinely believe it.

It is worth noting that Grimm is not alone in raising the above objection. For instance, Kelp (2014: 349) completely agrees with Grimm: 'I don't find Pritchard's case convincing essentially for the reasons given by Stephen Grimm.' Paulina Sliwa (2015) makes a similar objection to Pritchard's case.

In response, Pritchard accuses Grimm of missing the point. He claims that it was never part of his argument to 'suppose that the agent concerned had no conception at all of how cause and effect might be related, to the extent that we could seriously doubt whether the agent even had the conceptual resources to believe the target proposition' (Pritchard 2014: 321). However, he abandons that argument: he no longer talks about the possibility that one has no conception of how cause and effect might be related. He seems to realize that such talk is misleading at least.

Instead, Pritchard proposes an alternative account of understanding:

The crux of the matter is that there is more to understanding why an event took place than simply having some conception of how cause and effect might be related. In particular, what is required is some sort of grip on how this cause generated this effect, a grip of the kind that could be offered as an explanation were someone to ask why the event occurred. (Pritchard 2014: 321)

Here Pritchard claims that what distinguishes understanding from knowledge is that understanding requires a kind of grasp (or 'grip' in Pritchard's

own words) of how the cause generated the effect, while knowledge does not. This brings us to the second view of U: (b) U is having a grasp of how X and Y are causally related. Whereas (b) is widely accepted, philosophers differ on the nature of the kind of grasp involved in understanding.

Two accounts stand out. First, as we have seen, Pritchard (2014), among others, holds that this kind of grasp could be offered as an explanation when someone asks why the event occurred. More precisely, one has the kind of grasp just in case one is able to offer at least a rudimentary explanatory story of how the event occurred when prompted. Call it the explanation account.

Second, some philosophers (e.g., Woodward 2003; Grimm 2006; Hills 2015) hold that grasp is an ability to answer ‘what-if-things-had-been-different?’ questions.² More specifically, grasp is an ability ‘not just to register how things are, but also to anticipate how certain elements of the system would behave, were other elements different in one way or another’ (Grimm 2010: 89). Call it the counterfactual account.

How the counterfactual account is different from the explanation account depends on how each of them is spelled out. The two accounts are equivalent if to give a rudimentary explanatory story is just to answer a few ‘What-if?’ questions.

3. Defending the sufficiency thesis

In this section, I will defend the sufficiency thesis against the objection that understanding requires a certain kind of grasp while knowledge does not. Before launching in, I’d like to make a few assumptions:

- (A1) Understanding involves a kind of grasp. This view is widely endorsed by those who oppose the sufficiency thesis. I will assume it for the sake of argument.
- (A2) Understanding comes in degrees. This assumption is highly plausible. Some instances of understanding are shallow or rudimentary while others are deep or sophisticated. Suppose my child pushed her toy car to move. It is plausible to say that she has some rudimentary understanding of why the car is moving: because she pushed it. But a scientist who knows mechanics would have a sophisticated understanding of why the car is moving.³
- (A3) The kind of grasp required by understanding also comes in degrees. This (at least partially) explains why understanding comes in degrees. Critics of the sufficiency thesis would accept this assumption, no matter which account of grasp they endorse. In light of the explanation account, the more sophisticated explanatory story one can give, the deeper grasp one has. According to the counterfactual account, the

more 'what-if-things-had-been-different?' questions one can answer, the deeper grasp one has.

- (A4) If one knows that X was caused by Y and has some rudimentary grasp of how X and Y are causally related, then one has some rudimentary understanding of why X occurred. This assumption would also be accepted by critics of the sufficiency thesis, for they hold that grasp is what distinguishes understanding from knowledge. While insisting that knowledge is not sufficient for understanding, they would agree that (knowledge + grasp) is sufficient for understanding.

Clearly A4 depends on A1, A2, and A3. Together they form a coherent theory. Given A4, if I can show that one who knows that X was caused by Y (via testimony or other means) must have some rudimentary grasp of how X and Y are causally related, then the sufficiency thesis is established.

In what follows, I will argue that if either the explanation account of grasp or the counterfactual account is true, then one who knows that X was caused by Y (via testimony or other means) must have some rudimentary grasp of how X and Y are causally related.

3.1 Argument from the counterfactual account of grasp

Let us begin with the counterfactual account. My argument can be outlined as follows:

- (1) If one knows that X was caused by Y, then one can answer a few 'What-if?' questions.
- (2) If one can answer a few 'What-if?' questions, then one has some rudimentary grasp of how X and Y are causally related.
- (3) Therefore, if one knows that X was caused by Y, then one has some rudimentary grasp of how X and Y are causally related.

This argument is valid: if Premise 1 and 2 are true, the conclusion must be true. Premise 2 is the counterfactual account of (rudimentary) grasp, which I will assume here for the sake of argument.

To see Premise 1, reconsider the case where my child pushed her toy car to move. Suppose she believes that the car is moving because she pushed it, but when asked 'What if you had not pushed the car (*ceteris paribus*)?' She gets lost and does not know what to say. Then intuitively, she does not *know* that the car is moving because she pushed it. Let us also imagine that she was humming 'Driving in My Car' to herself while pushing the car. Suppose when asked 'What if you did not hum to yourself? Would the car still move?', she replied, 'Maybe. I do not know.' Then intuitively, she does not *know* that the car is moving because she pushed it, either. In order to

know this causal relationship, my child must be able to answer a few 'What-if?' questions such as 'What if you had not pushed the car?' and 'What if you had not hummed to yourself?' This case seems to generalize.

For those who do not find the above case convincing, I have two additional arguments for Premise 1. Here is the first one:

Sub-argument I

- (1) 'X was caused by Y' (at least partially) means that *ceteris paribus*, X would not have occurred had Y not occurred.
- (2) Thus, if one cannot figure out that *ceteris paribus*, X would not have occurred had Y not occurred, then one does not know that X was caused by Y.
- (3) If one can figure out that *ceteris paribus*, X would not have occurred had Y not occurred, then one is able to answer '*Ceteris paribus*, what if Y had not happened?'
- (4) Therefore, if one knows that X was caused by Y, then one is able to answer '*Ceteris paribus*, what if Y had not happened?'

The inference from Premise 1 to Premise 2 is valid. Compare: '5 is a prime number' partially means that 5 has no positive divisors other than 1 and itself. Thus, if one cannot figure out that 5 has no positive divisors other than 1 and itself, then one does not know that 5 is a prime number. Premise 3 is trivially true. The conclusion follows from Premise 2 and Premise 3. Hence, whether *Sub-argument I* is good depends on whether its Premise 1 is true.

Intuitively, Premise 1 of *Sub-argument I* is plausible.⁴ Consider the following case offered by J. L. Mackie (1965):

Suppose experts conclude that an electrical short-circuit at a certain place caused a fire in a certain house. Clearly they are not saying that the short-circuit was a necessary condition for this house's catching fire at this time; they know perfectly well that a short-circuit somewhere else, or a burning cigarette, or any one of a number of other things might, if it had occurred, have set the house on fire. Equally, they are not saying that the short-circuit was a sufficient condition for this house's catching fire, for if the short-circuit had occurred, but there had been no inflammable material nearby, the fire would not have broken out.

Hence, when experts say 'the short-circuit caused the fire,' they do not mean it is a necessary or sufficient condition for the fire. Rather, according to Mackie (1965), they mean that the short-circuit is an indispensable part of a complex sufficient (but not necessary) condition of the fire. Specifically, the short-circuit, the presence of inflammable material, the absence of a burning cigarette, and some other things constituted a complex condition that was sufficient for the house's catching fire-sufficient, but not necessary, for the fire could have started in other ways. But of this complex condition, the

short-circuit was an indispensable part: the other parts of this condition being equal, the fire would not have happened if the short-circuit had not happened.

This case shows that when we say 'X was caused by Y' or 'Y is among the causes of X,' what we (at least partially) mean is that *ceteris paribus*, if Y had not happened, then X would not have happened. This is exactly what Premise 1 of *Sub-argument I* states. If *Sub-argument I* is good, then knowing that X was caused by Y entails being able to answer '*Ceteris paribus*, what if Y had not happened?'

One might worry that to know the answer to '*Ceteris paribus*, what if Y had not happened?' is merely to know the meaning of 'Y is among the causes of X' or 'X is caused by Y.' It has nothing to do with knowing how X and Y are causally related. I disagree. It is possible that one knows that ('Y is among the causes of X' means that *ceteris paribus*, if Y had not happened, X would not have happened) without believing this counterfactual. If one knows that Y is among the causes of X, then one knows not only what 'Y is among the causes of X' means, but also knows the metaphysical proposition that *ceteris paribus*, if Y had not happened, X would not have happened.

My second argument will show that if one knows that X was caused by Y, then one is able to answer more 'What-if?' Questions in addition to '*Ceteris paribus*, what if X had not happened?' It runs as follows:

Sub-argument II

- (1) One knows that p (no matter whether it is via testimony or not) only if one can rule out the relevant alternatives to p.
- (2) Thus, there is a set of events, E, such that if one cannot rule out the possibility that X was caused by any member of E, then one does not know that X was caused by Y.
- (3) But if one can rule out the possibility that X was caused by a certain member of E, then one can answer that X would still have happened when asked 'What if that member of E were different in a certain way (*ceteris paribus*)?'
- (4) Therefore, if one knows that X was caused by Y, one can answer this sort of 'What-if?' question.⁵

Premise 1 of *Sub-argument II* is known as the relevant alternatives theory of knowledge. While this theory is often associated with contextualism or the denial of closure, it entails neither of them. By itself it is intuitively appealing. For instance, to know that the animal you are looking at is a zebra, you must be able to rule out that it is a lion, that it is a dog, etc. (Under normal circumstances, these alternatives are clearly relevant⁶). If the animal were a lion instead of a zebra, but you would still believe it is a zebra, then you are unable to rule out that it is a lion when it is in fact a zebra, and accordingly,

you do not know that it is zebra. This case seems to generalize. Anyway, I shall assume that the relevant alternatives theory is true.

Premise 2 of *Sub-argument II* clearly follows from Premise 1. Consider again the case where my child pushed her toy car to move. Here are some alternatives:

- The toy car is moving because she hummed ‘Driving in My Car’ to herself.
- The toy car is moving because she named her dog ‘Mia.’
- The toy car is moving because she slept at 10:00 pm last night.

These alternatives are clearly relevant: in order to know that the toy car is moving because she pushed it, my child must be able to rule out all these alternatives.

Premise 3 of *Sub-argument II* seems trivially true. For example, if my child can rule out that the toy car is moving because she hummed ‘Driving in My Car’ to herself, then she can surely answer the question ‘What if you had not hummed “Driving in My Car” to yourself (*ceteris paribus*)?’ From Premise 2 and Premise 3, it follows that if one knows that X was caused by Y, one can answer a few ‘What-if?’ questions (in addition to the question ‘What if Y had not happened?’).

By way of summary, I have argued that if one knows that X was caused by Y, then one has some rudimentary grasp of how X and Y are causally related, because (1) if one knows that X was caused by Y, then one can answer a few ‘What-if?’ questions, and (2) if one can answer a few ‘What-if?’ questions, then one has some rudimentary grasp of how X and Y are causally related. I offered an example to show that (1) is intuitively plausible. I also provided two sub-arguments to support (1). I did not argue for (2), which is the counterfactual account of (rudimentary) grasp. I employed (2) as a premise of my argument not because I endorse (2), but because the opponents of the sufficiency thesis endorse (2). My aim in this section is merely to defend the sufficiency thesis against their objections, not to offer a proof of the sufficiency thesis.

In what follows, I will address a few objections to my arguments.

Objection 1

One might bring up symmetrical over-determination to question my claim that ‘X was caused by Y’ (at least partially) means that *ceteris paribus*, X would not have occurred had Y not occurred. Suppose that A and B simultaneously shot bullets into a man’s heart and the man thereby died. Both A’s shooting and B’s are causally on par with respect to the man’s death (neither bullet arrives first, or knocks the other off course, etc.). Had A not shot the bullet, the man would still have died due to B’s shooting; had B not shot the bullet, the man would still have died due to A’s shooting. This is

a case of symmetric over-determination. It seems that you may know that A's shooting killed the man without believing that the man would not have died had A not shot. This further casts doubts on the meaning claim above.

Reply

This objection is not as forceful as it appears, however. After all, cases of symmetric over-determination are highly controversial. For example, Lewis does not even think such cases are worth taking seriously. He writes, 'Because it is unclear what we want to say, these symmetrical cases are not effective test cases for proposed analyses of causation. Set them aside' (Lewis 2000: 182). Many philosophers (cf. Paul 2009; Merricks 2001) even argue that symmetric over-determination is physically impossible. Here is a sample argument. It is true that each shooting alone would cause the man's death. But if A had not shot, the properties of the man's death would have been different; if B had not shot, the properties of the man's death would have been different. A difference in properties amounts to a difference in events. So over-determination is impossible. Moreover, even if there are cases of symmetric over-determination, they would not pose a serious challenge to my core argument. Taking over-determination into account, when we say 'X was caused by Y,' part of what we mean is that if no other things caused X at the same time, then X would not have occurred had Y not occurred. In principle, this meaning claim could be assimilated to my argument for the claim that if one knows that X was caused by Y, one can answer a few 'What-if' questions. Anyway, let us put symmetric over-determination aside.

Objection 2

One might object that in some cases, the causes of an event interacted in quite complex ways, such that one may know that X was caused by Y via testimony without being able to answer the 'What-if?' question very well, or at all. Take the question 'Why did Trump get elected in 2016?' The events that caused Trump to win were multilayered and interacted in quite complex ways. Suppose experts tend to agree that (D) one of the causes is that Democrats focused more on turning out supporters than growing the base. Suppose they are right, and I believe that D via their testimony. Then it seems that I know that D. But when asked 'What if Democrats focused more on growing the base?' I find it is hard to say. Similarly, it is hard to answer questions like 'What if the FBI did not publically reopen their investigation into Hillary Clinton's private email server during the campaign?' and 'What if Trump had gotten seriously ill a few days before the election?' In this case, one might say, while I know that D via testimony, I do not have any understanding of why Trump got elected in 2016, for understanding involves the ability to answer at least some of these 'What-if?' questions.

To be sure, this case is about understanding humans. But a similar case can be made with regard to understanding nature.

Reply

While it is difficult to tell what if Democrats had not focused more on turning out supporters than growing the base, it is easy to tell, if one truly knows that D, that *ceteris paribus*, if Democrats had not focused more on turning out supporters than growing the base, then Trump would not have gotten elected. For this is just what D means, as we have seen in the case offered by Mackie.

One might worry that the *ceteris paribus* clause does not obtain in complex cases (e.g., the Trump case): if Y had not happened, then other events in the system would have been different, too. Specifically, at a certain time, Y and many other events were all present, and Y interacted with some of those other events and caused X. But it is impossible that (Y is not present, but all those other events are present). Put differently, at least some of those other events ontologically depend on Y. Here is an illustration of an event ontologically depending another: the event that (E1) electricity is traveling through a certain wire ontologically depends on the event that (E2) electrons are moving from one atom to the next in the wire. It is impossible that (E1 is present, but E2 is not). Hence, it does not make any sense to ask 'What if E2 were not present while E1 is present?'

To this objection, I'd like to suggest that the proper 'What-if?' question to ask in such cases is '*Ceteris paribus*, what if Y and those events ontologically depend on Y had been different?' To know that Y is among the causes of X in such cases, one must be able to answer this 'What-if?' question.

In addition, I think that even in complex cases, one who knows that Y is among the causes of X must be able to answer many other 'What-if?' questions in addition to '*Ceteris paribus*, what if Y and those events ontologically depend on Y had been different?' Here is my argument:

- (1) To know that Y is among the causes of X, you must be able to figure out at least some of the things that did not help bring about X.
- (2) If you can figure out Z did not help bring about X, then you can tell that if Z did not happen, X would still have happened, that is, you can answer 'What if Z did not happen (*ceteris paribus*)?'
- (3) Therefore, to know that Y is among the causes of X, you must be able to answer 'What if some things did not happen (*ceteris paribus*)?'

I take Premise 2 to be trivially true. Premise 1 is intuitively appealing. Reconsider the simple case where my child pushed her toy car to move while humming 'Driving in My Car.' If my child cannot tell whether things such as that she slept at 10:00 pm last night, that she wore a red hat, that

she named her dog 'Mia,' and that she was humming 'Driving in My Car' helped cause her toy car to move, then intuitively, she does not really know that her push helped cause the car to move. Similarly, suppose I cannot tell whether things, such as that I coughed twice at home on a certain morning and that Trump uttered the word 'snow' during a certain speech, were also among the causes that made Trump get elected. Then intuitively, even if I believe that D via the testimony of experts, I do not know that D. To know that Y is among the causes of X, you must have some sense of what makes Y a contributing factor. But if you cannot figure out any of the things that did not help bring about X, then you have no sense of what makes Y a contributing factor.

Further, Premise 1 can also be derived from the relevant alternatives theory of knowledge according which, to know that p, one must be able to rule out all the relevant alternatives to p. An alternative to 'Y is among the causes of X' takes the form 'Y*, rather than Y, is among the causes of X.' In the Trump case, here is an alternative to D: the event (that I coughed twice at home on a certain morning) is among the causes while the event (that Democrats focused more on turning out supporters than growing the base) is not. This alternative is clearly relevant: one must rule it out in order to know that D. If one can rule out that the event (that I coughed twice at home on a certain morning) is among the causes, then one can answer 'What if I did not cough twice at home on that morning?'

Objection 3

One might accept that those who merely know can answer a few 'What-if?' questions, but object that the kind of grasp required by understanding is an ability to answer a set of 'What-if?' questions that those who merely know cannot answer. In fact, Hills (2015) seems to provide an argument for this view, which goes as follows:

- (1) Knowledge plays an extremely important epistemic social role: namely that knowledge can be shared quite easily through testimony.
- (2) Understanding does not play this role: neither sophisticated understanding nor rudimentary understanding can be shared easily through testimony.
- (3) If rudimentary understanding merely requires the ability to answer 'What-if?' questions such that knowledge is sufficient for rudimentary understanding, then rudimentary understanding can also play the role knowledge plays.
- (4) Therefore, rudimentary understanding requires more than the ability to answer 'What-if?' questions that is entailed by knowledge.

Reply

But I do not find this argument convincing for two reasons. First, Premise 1 is dubitable. It is controversial whether all instances of knowledge can be shared via testimony. For example, many (e.g. Cohen 2002; Sosa 2009) hold that knowledge that certain skeptical hypotheses (e.g., I am a brain-in-vat) are false cannot be transmitted via testimony. Some (cf. Hopkins 2007) argue that moral knowledge cannot be passed on via testimony. If a lot of instances of knowledge cannot be shared via testimony, then Premise 1 of Hill's objection is false.

In addition, Premise 2 seems to be false. Specifically, it is not implausible to say that at least some instances of understanding can be transmitted via testimony in the same way knowledge can be transmitted. Suppose my child accidentally pushed a wineglass off the table. It is easy for her to have a rudimentary understanding of why the wineglass breaks: because she accidentally pushed it off the table. It seems that such rudimentary understanding can be easily shared via testimony. Suppose I found a broken wineglass but had no idea why it is broken. So I asked my child. And she replied, 'because I accidentally pushed it off the table.' I had no reasons to think she was lying on this matter, because she was always honest. Thus I believed what she said. In this way, I also came to understand why the glass was broken. We find intuitively appealing the claim that understanding cannot be easily transmitted via testimony perhaps because we tend to focus on sophisticated or difficult understanding (e.g., understanding why the earth is an oblate spheroid).⁷

However, Hills (2015) seems to suggest an alternative explanation of why I can acquire understanding via my child's testimony: it is because I already had general understanding of why wineglasses tend to break when falling to the ground. What I acquired via my child's testimony is merely the information that she accidentally pushed the wineglass off the table. Before I acquired this information, I already had the ability (i.e., the grasp) understanding requires since I had general understanding. But this ability cannot be transmitted via testimony (because it is non-propositional and thereby cannot be expressed in words according to some philosophers). Thus, understanding cannot be transmitted via testimony.

I do not find this objection plausible. As we have seen, knowledge entails the ability to answer a few 'What-if?' questions, just like understanding. If understanding cannot be transmitted via testimony simply because this ability cannot be transmitted via testimony, then knowledge cannot be transmitted via testimony for the same reason. If in a sense, knowledge can be transmitted via testimony, then in the same sense, understanding can also be transmitted via testimony.

Objection 4

One might agree that Hill's arguments are flawed, but insist that the kind of grasp required by understanding is an ability to answer a set of 'What-if?' questions that those who merely know cannot answer. Consider the following argument:

- (1) Understanding why X happened requires a grasp of how X and Y are causally related (rudimentary understanding requires a rudimentary grasp).
- (2) Even a rudimentary grasp of how X and Y are causally related requires the ability to identify at least some causally relevant properties of X.
- (3) The ability to identify a causally relevant property entails the ability to answer a distinctive set of 'What-if?' question.
- (4) One might know X was caused by Y without being able to any 'What-if?' questions of this distinctive set.
- (5) Thus, one might know X was caused by Y without have any understanding of why X happened.

Premise 1 is not at issue here. Premise 2 is intuitively appealing. Suppose the event that (C) a certain green wire behind the refrigerator got overheated at 2:00 pm yesterday caused the event that (E) my house burned down at 4:00 pm yesterday. Suppose C has many properties, e.g., (F1) it involved a wire whose color is green, (F2) it happened when my child sang 'Smoke and Fire,' (F3) it involved an overheating of the wire, (F4) it happened in the presence of oxygen, etc. It seems that F1 and F2 are causally irrelevant properties to E, that is, they have no role in causing E. By contrast, F3 and F4 do play some role in causing E, that is, they are causally relevant to E. Intuitively, if I cannot figure out any causally irrelevant property of C, I do not have even a rudimentary grasp of how C and E are causally related, and thereby do not have any understanding of why E happened.

Here is an illustration of Premise 3. Suppose C' is an event that differs from (C) the event happening behind the refrigerator yesterday afternoon in only one property (F3): C' does not involve an overheating of any wires while C does. If one cannot answer 'What if C' instead of C had happened (*ceteris paribus*)?' then one does not believe that F3 is a causally relevant property. That is, the ability to identify F3 as a causally relevant property entails the ability to answer this 'What-if?' question. If one is merely able to answer questions such as 'What if the wire were not green (*ceteris paribus*)?' and 'What if C had not happened (*ceteris paribus*)?' one cannot identify F3 as a causally relevant property. For if one can merely answer the question 'What if the wire were not green (*ceteris paribus*)?' then one can identify F1

as causally irrelevant, but one fails to identify any causally relevant properties. Moreover, it seems that even if one can answer 'What if C had not happened (*ceteris paribus*)?' one might fail to tell which properties of C are causally relevant and which are not.

Here is an argument for Premise 4. Suppose I have always been a reliable source of information for my child. I know that C caused E. My child acquires the belief that C caused E via my testimony. She trusts me and has no reason to doubt this proposition. Then she also knows that C caused E, though she might fail to identify any causally relevant properties and to answer any corresponding 'What-if' questions.

Reply

I find Premise 1, 2, and 3 all plausible, but I do not think Premise 4 is true. Intuitively, if one cannot identify any causally relevant properties of Y, then one does not know that X was caused by Y. To be sure, one might believe that X was caused by Y without being able to figure out any causally relevant properties. But knowledge of the causal relationship requires this ability. Reconsider the case where my child pushed her toy car to move. If she cannot answer 'What if you had merely touched the car without pushing it?' which means that she is unable to identify the car's being pushed as a causally relevant property, then intuitively, she does not know that the car is moving because she pushed it. Similarly, in the fire case, suppose I tell my child that what happened behind the refrigerator yesterday afternoon caused the house to burn down. Since she trusts me (I have been a reliable source of information for her), she believes what I say. But when asked 'If the wire behind the refrigerator had not gotten overheated (*ceteris paribus*), would the house still have burnt down?' she replies 'yes, because a green wire has a magic power to make a fire.' This means that she is unable to identify F3 as a causally relevant property. Then she clearly does not *know* that what happened behind the refrigerator yesterday afternoon caused the house to burn down.

For those who do not share my intuition, here is an argument. To know that p, one must be able to rule out all the relevant alternatives to p. As I have previously noted, although philosophers disagree on which account of relevance is true, it is sometimes uncontroversial that certain alternatives are clearly relevant. In the fire case, the possibility that C' caused the house to burn down is clearly a relevant alternative one must be able to rule out in order to know that C caused the house to burn down (at least under normal circumstances). Since my child cannot rule out that C' was the cause, she does not know that C caused the house to burn down. Now if one knows that C caused the house to burn down, and one can also rule out that C' was the cause, then one can figure out that the overheating of a certain wire is a

causally relevant property. Thus, knowing that C caused the house to burn down entails being able to figure out at least some causally relevant properties.

Admittedly, the above argument centers on a specific case (under normal circumstances). But I think it can generalize: in all cases, knowing that X was caused by Y entails being able to figure out at least some causally relevant properties. At least, I hope I have shown that this claim is not implausible.

3.2 Argument from the explanation account of grasp

Now let us consider the explanation account, which states that one has some grasp of how X and Y are causally related just in case one is able to offer at least a rudimentary explanatory story of how X occurred when prompted. As we have seen above, Pritchard claims that understanding requires this ability while knowledge does not. To illustrate the point, Pritchard asks us to consider a case where Kate, a scientist, believes that it was the introduction of the oxygen which caused a certain chemical reaction 'not because she figured this out for herself, but because a fellow scientist, who has specialized expertise in this regard which our hero lacks, informs her that this is the cause of the reaction' (Pritchard 2014: 316). Now 'since [Kate] is a scientist, she surely has some conception of how the introduction of oxygen might cause the chemical reaction in question' (Pritchard 2014: 321). So 'certainly we would credit [Kate] with both the relevant belief and the corresponding knowledge too' (ibid.). However, if Kate were asked the question of how the introduction of the oxygen caused the chemical reaction, she would be unable to 'offer even a rudimentary explanatory story about how the oxygen caused this effect' (Pritchard 2014: 323).

Whether this case is convincing depends on what counts as a rudimentary explanatory story. Normally, 'X was caused by Y' counts as explanation of why X occurred. But what Pritchard means by 'an explanatory story' is clearly more than the explanation that X was caused by Y. Rather, it must tell us something about how X was caused by Y or how X and Y are causally related.

However, Pritchard does not further specify what constitutes a rudimentary explanatory story. If the ability to give a rudimentary explanatory story is entailed by the ability to answer a few 'What-if?' questions (say, to give a rudimentary explanatory story is just to answer a few 'What-if?' questions), then the arguments I made in the previous section can also show that the sufficiency thesis is true given the explanation account of grasp. Thus Pritchard's case is unconvincing.

If Pritchard's case is to be convincing, that is, if Kate can know that the introduction of the oxygen caused a certain chemical reaction without being

able to give even a rudimentary explanatory story, then the ability to give a rudimentary explanatory story is not entailed by the ability to answer a few 'What-if?' questions. In what follows, I will consider, on behalf of Pritchard, an appealing hypothesis about what constitutes a rudimentary explanatory story: to give a rudimentary explanatory story of how X was caused by Y is to offer a somewhat detailed description of the causal chain between Y and X. Take Pritchard's case that the fire was caused by faulty wiring. A detailed description of the causal chain would look like this:

The faulty wiring caused the electrons to move faster through wires. When the electrons moved faster, they possessed greater kinetic energy. Thus when the electrons bumped into the atoms that make up the wire, they transferred more of its kinetic energy to the atoms. Consequently, more kinetic energy is transformed into the thermal energy, which caused the wires to overheat. The heat and the oxygen caused the wires to burn.

To give a rudimentary explanatory story of how the fire was caused by faulty wiring, one does not have to describe every step in the causal chain between faulty wiring and the fire. But if one cannot figure out any step between the faulty wiring and the fire, then one is unable to give a rudimentary explanatory story of how the fire was caused by faulty wiring, that is, one does not have any grasp of the underlying causal mechanism. Thereby, one does not have any rudimentary understanding of why the fire started.

The above analysis can help make sense of the chemistry case: Kate is unable to give a rudimentary explanatory story of how the introduction of the oxygen caused a certain chemical reaction, because to give such a story is to offer a somewhat detailed description of the causal chain between the introduction of the oxygen and the chemical reaction, but Kate cannot figure out any step between the two. And yet, despite that, Kate still knows that the introduction of the oxygen caused the chemical reaction via the testimony of a fellow scientist. This case is intuitively appealing because we tend to think of scientific understanding in a scientific context, and scientific understanding often involves the ability to offer a detailed description of the causal chain between two events.

However, the requirement that understanding involves the ability to offer a somewhat detailed description of the causal chain seems too demanding. My child surely has some rudimentary understanding of why her toy car is moving even though she is unable to figure out any middle steps in the causal chain between her push and the movement of the car. Here is another example. Suppose you turn on/off the light by flicking the switch. Most people would have a rudimentary understanding of why the light is on/off: because you flicked the switch. But very few people can figure out any middle steps in the causal chain. If rudimentary understanding requires

the ability to give a story that describes some middle steps in the causal chain, then most people would not have any rudimentary understanding of why the light is on/off. That would induce widespread skepticism. (In contrast, if rudimentary understanding simply requires the ability to answer a few 'What-if?' questions, then we can easily explain why most people understand why the light is on/off.)

The same conclusion can also be reached via the following argument. There seem to be cases where X was caused by Y but there are no middle steps in the causal chain between Y and X. Take the fire case again. When asked how the fire was caused by faulty wiring, you can respond that (faulty wiring caused M1, and then M1 caused the fire). When further asked how the fire was caused by M1, you can respond that (M1 caused M2, and then M2 caused the fire). When further asked how the fire was caused by M2, you can point to a middle step between the fire and M2. However, this process cannot go *ad infinitum*. There must be a metaphysical end where the chemical reaction was caused by a certain event but there are no middle steps in the causal chain between the two events. Ahlstrom-Vij and Grimm (2013: 331) seem to make a similar point, as they write,

Imagine that the experienced fire investigator is trying to teach her apprentice how to identify the causes of fires... Pretty soon, the novice will start to ask questions: "Why would this-or-that factor have this-or-that effect?" and so on. The investigator will do her best to answer the relevant questions with reference to the chemistry and physics of fires – radiation, conduction, proportioning, and so forth – but at some point the why-questions have to stop. Because when the why-questions have probed deep enough, the investigator is just going to have to resort to saying "Well, can't you see that, if these factors are present, that's what's going to happen?"

The investigator can answer a few 'What-if?' questions (e.g., the event would not have happened if these factors had not present) at the metaphysical end of explanation, but she cannot point to a middle step and offer a description of the causal chain.

In general, if X was caused by Y, and the metaphysical end is reached, it is impossible to describe any middle steps in the causal chain between Y and X. Thus, if grasping why X occurred requires the ability to describe some middle steps in the causal chain between Y and X, then one cannot, in principle, grasp why X occurred in those cases. But one can, in principle, grasp why X occurred in those cases. Thus, grasping why X occurred does not require such an ability. Therefore, if the kind of grasp required by understanding is an ability to offer at least a rudimentary explanatory story of how X was caused by Y, this ability does not entail the ability to describe some middle steps in the causal chain between Y and X. Rather, I'd like to suggest that this ability is just the ability to answer a few 'What-if?' questions. If that is correct, then one can also

have some grasp of how two events are causally related without being able to describe some middle steps between them in cases where there are such middle steps.⁸

Allow me to briefly summarize the discussion in this section. The explanation account states that grasp is an ability to offer at least a rudimentary explanatory story. I consider two views about what constitute a rudimentary explanatory story: (i) to give a rudimentary explanatory story is just to answer a few 'What-if?' questions; (ii) to give a rudimentary explanatory story is to offer a somewhat detailed description of the causal chain. Given (i), the explanation account collapses into the counterfactual account. I have shown that (ii) is implausible, as it is too demanding. Thus I conclude that the sufficient thesis has not been refuted.

4. An implication

If my analysis above is correct, then it casts doubt on an influential account of the epistemic value of understanding. According to Pritchard (2010), understanding is distinctively valuable because understanding, unlike knowledge, is a kind of cognitive achievement. This account is supposed to apply to all instances of understanding, including rudimentary understanding. The argument for this account Pritchard (2010) provides can be summarized as follows:

- (1) 'Achievements are successes that are because of ability where the success in question either involves the overcoming of a significant obstacle or the exercise of a significant level of ability.' (Pritchard 2010: 70)
- (2) Understanding why X occurred requires an ability to give at least a rudimentary explanatory story about how X was caused by Y.
- (3) If 2, then all instances of understanding are cognitive successes because of ability where the success in question either involves the overcoming of a significant cognitive obstacle or the exercise of a significant level of cognitive ability. (cf. Pritchard 2010: 82–83)
- (4) Therefore, all instances of understanding are cognitive achievements.

Not all instances of knowledge, however, are cognitive achievements according to Pritchard, for one can acquire knowledge through testimony but the cognitive success in question might involve neither the overcoming of a significant obstacle nor the exercise of a significant level of ability. For example, you know that your birthday is Feb 8th because your mom told you so. It is easy to acquire this knowledge. You do not have to overcome any significant obstacle or exercise any significant level of

cognitive ability. Therefore, some instances of knowledge are not cognitive achievements.

If the sufficiency thesis is true, however, Pritchard's argument would fail. Let us grant that Premise 1 and 2 of Pritchard's argument are true for the sake of argument. I will argue that if the sufficiency thesis is true, then Pritchard's conclusion is false, so is Premise 3.

Specifically, it seems that at least in some cases, while knowledge that X was caused by Y via testimony is a success because of ability, the success in question involves neither the overcoming of a significant obstacle nor the exercise of a significant level of ability. Reconsider the case where I know that the wineglass is broken because my child accidentally pushed it off the table. I know this because my child told me so. It is so easy for me to acquire this knowledge via testimony: I do not have to overcome any significant obstacle or exercise any significant level of ability. The sufficiency thesis implies that if one knows that X was caused by Y via testimony, one has a rudimentary understanding of why X occurred. Thus, not all instances of understanding are cognitive successes because of ability where the success in question either involves the overcoming of a significant cognitive obstacle or the exercise of a significant level of cognitive ability. Consequently, given Premise 1 of Pritchard's argument, not all instances of understanding are cognitive achievements; given Premise 2 of Pritchard's argument, its Premise 3 is false.

5. Conclusion

To sum up, I have defended the sufficiency thesis of the propositional knowledge account of understanding: knowing-that is sufficient for understanding-why. A major objection to this thesis is that understanding-why requires a kind of grasp while knowledge-that does not. I have discussed two accounts of grasp in recent literature and argued that if either is true, then knowing that X was caused by Y entails at least a rudimentary understanding of why X occurred. I have also showed that if the sufficiency thesis is true, Pritchard's argument that understanding is a kind of cognitive achievement is untenable.

In closing, I'd like to note that I did not claim that knowledge that X was caused by Y is sufficient for a sophisticated understanding of why X occurred. In fact, I believe that one might know that X was caused by Y without having a sophisticated understanding of why X occurred. Suppose S1 not only knows that X was caused by Y but also has a sophisticated understanding of why X occurred. It is not difficult to find a case where S2 knows that X was caused by Y via S1's testimony but fails to have the kind of sophisticated understanding that S1 has. But this does not mean that sophisticated understanding cannot be transmitted via testimony. Rather, I

tend to think that a sophisticated understanding of why X occurred can be reduced to (knowledge that X was caused by Y + propositional knowledge of relevant causal relations). Admittedly, this view has been challenged by many philosophers (e.g., Grimm 2006; Hills 2015). The main worry is that at least some instances of sophisticated understanding involve non-propositional grasp and thus cannot be expressed in language while propositional knowledge can be expressed in language. But I do not think all elements entailed by propositional knowledge can be expressed in language. As I suggested in Section 3, the ability to answer 'What-if?' questions seems to be non-propositional but entailed by propositional knowledge. Whether sophisticated understanding involves a special kind of non-propositional grasp that is not entailed by any instance of propositional knowledge is a topic that deserves a separate paper.

Notes

1. I'd like to note that my goal here is *not* to defend the claim that knowledge is both necessary and sufficient for understanding. So I will not discuss the familiar arguments against the idea that knowledge is necessary for understanding, such as that one can have lucky understanding (cf. Pritchard 2010) and that understanding is not factive (cf. Elgin 2004). Anyway, as Hills (2015) notes, the claim that knowledge is not necessary for understanding is more controversial than the claim that knowledge is not sufficient for understanding.
2. Hills' account of grasp is a little complicated. On her view, if you understand why X occurred, you can give an explanation of why X occurred and you can do the same in similar cases. But to have knowledge why, 'you do not need to be able to judge new cases correctly: this kind of cognitive control is essential to understanding, but not knowledge' (Hills 2015: 10). In short, understanding requires the ability to judge similar cases correctly while knowledge does not. In the same paper, Hills (2015: 8) claims that the ability to judge new cases correctly is equivalent to the ability to answer 'What-if?' questions. Hence, if we stipulate that grasp is what distinguishes understanding from knowledge, then Hill's view is that that grasp is an ability to answer 'What-if?' questions.
3. It is true that sophisticated understanding is more epistemically interesting than rudimentary understanding. But that does not mean an account of understanding in general can ignore cases of rudimentary understanding.
4. The meaning claim here is not equivalent to the counterfactual analysis of causation, which roughly states that X was caused by Y just in case X would not have occurred had Y not occurred. The counterfactual analysis might be wrong since there might be cases where the counterfactual is true but X was not caused by Y (cf. Kim 1974). But the meaning claim merely implies that the counterfactual is a necessary condition for causation. It is intuitively plausible.
5. Sullivan (2018) makes a different argument that knowledge, like understanding, involves the ability to answer questions.

6. Not all alternatives are relevant (to obtaining knowledge), and sometimes it is not clear whether an alternative is relevant. But sometimes we can easily tell whether an alternative is relevant even if we do not have a general account of relevancy.
7. For an argument that easy understanding can be transmitted via testimony, see Boyd (2017).
8. Lipton (2009) argues that we can achieve scientific or sophisticated understanding without having an explanation. In contrast, Strevens (2013) contends that there is no scientific understanding without explanation. But if one can understand why (X was caused by Y) is the case at the metaphysical end, Strevens' view seems to be false, because there cannot be any explanation of the fact that X was caused by Y.

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