# Dispositional Properties and Counterfactual Conditionals

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For the last several decades, dispositional properties have been one of the main topics in metaphysics. Still, however, there is little agreement among contemporary metaphysicians on the nature of dispositional properties. Apparently, though, the majority of them have reached the consensus that dispositional ascriptions cannot be analysed in terms of simple counterfactual conditionals. In this paper it will be brought to light that this consensus is wrong. Specifically, I will argue that the simple conditional analysis of dispositions, which is generally thought to be dead, is in fact an adequate analysis of dispositions. I will go on to discuss Mumford's view of dispositions from the perspective of the simple conditional analysis of dispositions.

## 1. The simple conditional analysis of dispositions

Dispositional properties[1] raise many philosophical issues that are not only important in their own right but also have great implications for other areas of philosophy such as philosophy of mind, philosophy of science and ethics.[2] Some issues concern the semantic question of what we mean when we are talking about dispositional properties and others concern the ontological question of what is the nature of dispositional properties that exist in the world. I agree with Mellor who recommends that we address the semantic issues first and then move on to the ontological issues since 'we can hardly say what dispositions are without some idea of what we mean by crediting things with them' (Mellor 2000, p. 758).

It is obvious that we mean something like counterfactual conditionals when talking about dispositional properties. In fact, almost no philosophers deny that there is *some* connection between dispositional properties and counterfactual conditionals. For this reason, one of the

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[1] Not all the dispositional properties I will discuss in what follows are Lewis's natural or sparse properties which are considered to play fundamental roles in our scientific understanding of the world. By 'property' I thus mean Lewis's abundant property, not his natural or sparse property. For Lewis's distinction between abundant and sparse properties, see Lewis 1983.

[2] For a clear statement of this point, see Fara 2005, pp. 43–4.

most important semantic issues concerning dispositional properties has been how to analyse dispositional ascriptions in terms of counterfactual conditionals. But the connection between dispositional ascriptions and counterfactual conditionals has proved to be quite elusive—so much so that many philosophers now think that it is not possible to analyse dispositional ascriptions in terms of counterfactual conditionals. But I will argue below that the simple conditional analysis of dispositions, which is generally taken to be wrong, *is* in fact an adequate analysis of dispositions.

Let us start with the following formulation of the simple conditional analysis of dispositions:

(SCA)   Something $x$ has the disposition at time $t$ to exhibit manifestation $m$ in response to being situated in stimulating circumstance $c$ iff, if $x$ were to be situated in $c$ at $t$, it would exhibit $m$.

In what follows, (SCA) will be treated under 'Lewis's two-step approach' to dispositions (Choi 2003, pp. 576–7). The first step of this approach is to define dispositions in the 'overtly dispositional locution'—the disposition to exhibit a manifestation in response to being situated in a stimulating circumstance—by specifying their specific stimulating circumstances and manifestations.[3] For short, call dispositions that are explicitly couched in the overtly dispositional locution 'canonical dispositions'. The second step of Lewis's approach is to explain what it means to say that something has such and such a canonical disposition. (SCA) is pertinent to this second step, saying that canonical dispositions should be analysed in terms of simple counterfactual conditionals. For instance, with the aim of analysing the dispositional property of *being poisonous*, we may first define it to be the disposition to cause death in response to being ingested, which constitutes the first step of Lewis's two-step approach. The second step in analysing the dispositional property of being poisonous under Lewis's two-step approach is to work out an account of the disposition to cause death in response to being ingested. According to (SCA), $x$'s being disposed to cause death in response to being ingested means that $x$ would

[3] In Choi 2003 I proposed that the overtly dispositional locution takes the form of the disposition to exhibit a manifestation in response to a *stimulus*. But I have proposed above that the overtly dispositional locution takes the form of the disposition to exhibit a manifestation in response to *being situated in a stimulating circumstance*. The reason why I have slightly modified the form of the overtly dispositional locution is that, whilst sometimes we are inclined to say that $x$ is disposed to break in response to being struck in the absence of extrinsic interfering factors, it sounds more natural to say that the absence of extrinsic interfering factors is part of a stimulating circumstance than to say that it is part of a stimulus. But this is merely a matter of terminology, which will make no substantive difference to what follows.

cause death if ingested. With these two steps combined, we have an analysis of being poisonous: $x$'s being poisonous means that $x$ would cause death if ingested. This is Lewis's two-step approach, which is immensely helpful in clarifying what it takes to give an analysis of dispositions and what the conditional analysis of dispositions is supposed to do.

## 2. Bird's antidotes

In the following I will first delve into the question of how to analyse canonical dispositions and defend (SCA); and then I will investigate the question of how to develop an analysis of conventional dispositions like water-solubility and elasticity from (SCA). Let us take the example of the disposition to break in response to being struck for which (SCA) gives the following account:

(1)  Something $x$ has the disposition at $t$ to break in response to being struck iff, if $x$ were to be struck at $t$, it would break.

Unfortunately, however, it appears that (1) faces obvious counterexamples. First consider Bird's (1998, p. 228) well-known case of dispositional antidotes:

*Bird's antidote case* A glass $G_1$ is struck but does not break because, quick as a flash, a sorcerer administers an antidote that cancels out the shock of the striking and thereby aborts the process of breaking. For Bird, $G_1$ has the disposition to break in response to being struck—for short, call this disposition '$D_1$'—and therefore the analysandum of (1) is satisfied. In this case, however, the analysans of (1) is not satisfied since $G_1$ would not break if struck. On Bird's view, therefore, (1) does not provide a necessary condition for $D_1$.

But I will now argue that Bird's case is unsuccessful on the grounds that, despite Bird's view, $G_1$ does not have $D_1$.[4]

The glass $G_1$ is struck but does not break because of the masking operation of the sorcerer. Bird maintains, nevertheless, that $G_1$ has the disposition to break in response to being struck, namely, $D_1$. But I suggest that, as Lewis (1997, p. 145) intimates, if an object is situated in a stimulating circumstance $c$ but does not exhibit a manifestation $m$ because of the masking operation of a dispositional antidote, we will deny that it has the disposition to exhibit $m$ in response to being situ-

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[4] Bird (1998, p. 230) anticipates this criticism and gives his own response to it. In Choi 2003 (pp. 577–8), however, I pointed out that Bird's response does not succeed.

ated in $c$; instead we will ascribe to it the disposition to exhibit $m$ in response to being situated in $c$ in the absence of the antidote. For me, therefore, $G_1$ is not disposed to break in response to being struck but is disposed to break in response to being struck in the absence of the sorcerer. $G_1$ does not manifest the disposition to break in response to being struck in the absence of the sorcerer—for short, call this disposition '$D_2$'. This is because it is not struck in the absence of the sorcerer, that is, it is not situated in the $D_2$-specific stimulating circumstance. On the one hand, consequently, $G_1$ has $D_2$ but does not manifest $D_2$ because it is not situated in the $D_2$-specific stimulating circumstance. On the other hand, $G_1$ is situated in the $D_1$-specific stimulating circumstance but does not manifest $D_1$ simply because it does not have $D_1$. Thereby, $G_1$ does not manifest $D_1$ nor $D_2$. That is, $G_1$ does not break.

It is evident that, in my view, Bird's case fails to jeopardize (SCA). Assuming that $G_1$ does not have $D_1$, (SCA) is not troubled by the fact that $G_1$ does not satisfy the analysans of (SCA) for $D_1$. Meanwhile, I suggest that $G_1$ has $D_2$, which does not spell trouble for (SCA), either. For $G_1$ would break if struck in the absence of the sorcerer and hence it does satisfy the analysans of (SCA) for $D_2$. So, Bird's antidote case is unsuccessful.

The key difference between Bird and me is that Bird holds that $G_1$ has $D_1$ whereas I deny it. On what ground does Bird maintain that $G_1$ has $D_1$? Bird is not explicit about this. Here note that it is intuitively unquestionable that $G_1$ is fragile. If so, one reason why Bird thinks that $G_1$ has $D_1$ would be that $D_1$ is identical to fragility, and therefore $G_1$ has $D_1$. I take it though that this is not a good reason. To begin with, it is generally accepted that dispositional properties are individuated by their specific stimulating circumstances and manifestations (Ellis and Lierse 1994, p. 36; Mumford 1998, p. 198; Malzkorn 2001, p. 452). And, in the present context, $D_1$ is a dispositional property such that its specific stimulating circumstance is the event of being struck and its specific manifestation is the event of breaking. If so, whether or not $D_1$ is identical to fragility depends on whether or not the fragility-specific stimulating circumstance and manifestation are identical to the events of being struck and breaking, respectively. But, as will become clear in section 4, the fragility-specific stimulating circumstance and manifestation are not identical to the events of being struck and breaking, respectively.[5] If so, $D_1$ is not identical to fragility.[6] This means that it does not immediately follow from $G_1$'s being fragile that $G_1$ has $D_1$. Moreover, our intuition that $G_1$ is fragile can be accommodated by saying that $G_1$

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[5] This is also argued in Choi 2003 (p. 577) and Choi 2006 (pp. 374–5).

has the disposition to break in response to being struck in the absence of the sorcerer, that is, $D_2$. And, this means that, once we accept that $G_1$ has $D_2$, we can accommodate our intuition that $G_1$ is fragile without assuming that $G_1$ has $D_1$. But it is indisputable that $G_1$ has $D_2$. That being said, the assumption that $G_1$ has $D_1$ is not necessary to explain our intuition that $G_1$ is fragile. From this I conclude that Bird cannot support his claim that $G_1$ has $D_1$ by relying on our intuition that $G_1$ is fragile.

Are there any other ways to attempt to support Bird's claim that $G_1$ has $D_1$? Here is one. As many philosophers point out, we rely heavily on the intrinsic nature of dispositions when we make intuitive judgements about dispositional ascriptions (Quine 1960, p. 224; Choi 2005, p. 499). For instance, we are inclined to believe that an iceberg on a distant planet is disposed to melt if heated on the grounds that its duplicates on earth are disposed to melt if heated. Bird might pick up on this observation and assert that the intrinsic nature of dispositions can provide good support for his claim that $G_1$ has $D_1$. To see if this line of thought will help Bird, let us first define a nomically intrinsic disposition to be a disposition $D$ such that for every pair $x$ and $y$ of nomic duplicates, $x$ has $D$ iff $y$ has $D$, where a nomic duplicate of $x$ is a perfect duplicate of $x$ that is subject to the same laws of nature as $x$. According to this definition, in case $x$ has a nomically intrinsic disposition, so does its perfect duplicate that is subject to the same laws of nature as $x$. For instance, given that an electron $e$ is electrically charged, we tend to believe that a perfect duplicate of $e$ is also electrically charged as long as it is governed by the same laws of nature including Coulomb's law as $e$. According to the definition of nomically intrinsic disposition presented above, this tendency may be justified by saying that the property of electric charge is a nomically intrinsic disposition, which I think is in line with our intuitive understanding of nomically intrinsic disposition.

With the notion of nomically intrinsic disposition at hand, the Intrinsic Dispositions Thesis may be stated in this way: every disposition is a nomically intrinsic disposition. This thesis, in one form or another, is espoused by a number of contemporary philosophers of dispositions including Lewis (1997), Armstrong (1973), and Molnar (1999).

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[6] I acknowledge that we sometimes use the expression 'the disposition to break in response to being struck' in such a non-standard way that it refers to fragility whatever the exact fragility-specific stimulating circumstance and manifestation may be. According to this use, to say that something is disposed to break in response to being struck is simply another way of saying that it is fragile. Then it is a trivial truth that fragility is identical to $D_1$. But I believe that we have another standard use of the expression 'the disposition to break in response to being struck' according to which it refers to a dispositional property such that its specific stimulating circumstance is the event of being struck and its specific manifestation is the event of breaking.

Let us now consider a nomic duplicate $G_2$ of the glass $G_1$ that is not guarded by any sorcerers. Undoubtedly, this unprotected glass $G_2$ has the disposition to break in response to being struck, namely, $D_1$. But, according to the Intrinsic Dispositions Thesis, the two glasses, $G_1$ and $G_2$, must have every disposition in common. Then it follows that $G_1$ has $D_1$ as well. If so, on the assumption of the Intrinsic Dispositions Thesis, we would have to say that $G_1$ has $D_1$. Once this is recognized, it seems that the intrinsic nature of dispositions backs up Bird's claim that $G_1$ has $D_1$. I will argue below, however, that this is not the case.

First of all, I agree with McKitrick (2003) that some full-fledged dispositions are not nomically intrinsic dispositions. For instance, my key currently has the disposition to open my front door but it would lose this disposition if I were to change my key's environment, specifically, if I were to change the lock on my front door. This means that my key's disposition to open the front door is not a nomically intrinsic disposition. Based on this observation, I am convinced that the Intrinsic Dispositions Thesis is false. But this does not entirely undermine Bird's possible justification for the claim that $G_1$ has $D_1$. Note that, assuming that $D_1$ is a nomically intrinsic disposition, $D_1$ should be shared by $G_1$ and $G_2$. As a consequence, in spite of the falsity of the Intrinsic Dispositions Thesis, once $D_1$ is a nomically intrinsic disposition, $G_2$'s having $D_1$ entails $G_1$'s having $D_1$; thereby, in so far as $D_1$ is a nomically intrinsic disposition, Bird can justify his claim that $G_1$ has $D_1$ on the grounds that $G_2$ has $D_1$.

That being said, what matters is whether $D_1$ is a nomically intrinsic disposition or not. In Choi forthcoming, I propose an extensionally correct and practically useful criterion for identifying nomically intrinsic dispositions that goes as follows:

(2)   A disposition $D$ is a nomically intrinsic disposition only if every object that has $D$ has an *intrinsic causal basis* for $D$, that is, an intrinsic property or property-complex that serves as a causal basis for $D$.

Following Prior, Pargetter, and Jackson (1982, p. 251), I define a causal basis for $D$ to be a property or property-complex that, together with the $D$-specific stimulating circumstance, is a causally operative sufficient condition for the $D$-specific manifestation in the case of 'surefire' dispositions, and in the case of probabilistic dispositions is causally sufficient for the relevant chance of the $D$-specific manifestation. For instance, a causal basis for $D_1$ is a property or property-complex that, together with the event of being struck, is a causally operative sufficient

condition for the event of breaking. Then what is a causally operative sufficient condition? It would be a formidable job to give a detailed answer to this question. Fortunately, however, we do not need a detailed answer for the present purpose. To a first approximation, a causally operative *sufficient* condition for $x$ is such that, given the laws of nature, whenever the condition is present it is causally necessary that $x$ occurs.

In Choi forthcoming, I contend that, when we carefully analyse the notions of nomically intrinsic disposition and causal basis, it is quite reasonable to embrace (2). I contend further that (2) conforms to our intuitive understanding of nomically intrinsic disposition in the sense that it delivers the right verdicts on intuitive cases. For example, it is shown that, according to (2), the disposition to open my front door is not a nomically intrinsic disposition, which is in keeping with our intuitive judgement. With this in mind, I take it that (2) is a viable characterization of nomically intrinsic disposition.

I will now attempt to demonstrate that $D_1$ fails to come out a nomically intrinsic disposition by (2). As I said earlier, it is plausible to suppose that the unprotected glass $G_2$ is disposed to break in response to being struck. Since $G_2$ has $D_1$, according to (2), $D_1$ is a nomically intrinsic disposition only if $G_2$ has an intrinsic causal basis for $D_1$. In the following, however, I will argue that $G_2$ has no intrinsic causal basis for $D_1$, and therefore that $D_1$ does not qualify as a nomically intrinsic disposition by (2). Consider a property-complex $T$ composed of all the intrinsic properties of $G_2$. I think that $T$ does not serve as a causal basis for $D_1$, that is, that $T$, together with the event of being struck, is not a causally operative sufficient condition for the event of breaking. Consider the protected glass $G_1$. Since $G_1$ is a perfect duplicate of $G_2$ and $T$ is composed of the *intrinsic* properties of $G_2$, $G_1$ has $T$. And, as already noted, if $G_1$ were to be struck, it would not break; and thereby it would not be causally necessary that $G_1$ breaks. Hence, given the laws of nature, even if $G_1$ were to have $T$ and be struck, it would not be causally necessary that $G_1$ breaks. This means that it is not the case that, given the laws of nature, whenever an object has $T$ and is struck, it is causally necessary that the object breaks. That is, it is not the case that, given the laws of nature, whenever the condition that $x$ has $T$ and is struck is present it is causally necessary that $x$ breaks. Consequently, $T$, together with the event of being struck, is not a causally operative sufficient condition for the event of breaking. This being the case, $T$ does not serve as a causal basis for $D_1$.

To put it simply, to say that $T$ is a causal basis for $D_1$ is to say that, for each $x$, $x$'s having $T$ causally suffices for $x$'s breaking upon being struck. But $G_1$ has $T$ but does not break upon being struck. Therefore, $T$ is not a causal basis for $D_1$. In view of the fact that $T$ is composed of *all* the intrinsic properties of $G_2$, it is reasonable to assume that $G_2$ has no other *intrinsic* properties or property-complexes that would serve as a causal basis for $D_1$. If so, $G_2$ does not have an intrinsic causal basis for $D_1$. Then, according to (2), $D_1$ is not a nomically intrinsic disposition since $G_2$ has $D_1$ but does not have an intrinsic causal basis for $D_1$. But, given that $D_1$ is not a nomically intrinsic disposition, $G_2$'s having $D_1$ does not necessitate $G_1$'s having $D_1$. This means that Bird cannot support the claim that $G_1$ has $D_1$ by appealing to the intrinsic nature of dispositions.[7]

Thus far I have considered some possible reasons to accept Bird's claim that $G_1$ has $D_1$ and argued that they are not good reasons. Still, however, Fara may insist that $G_1$ has $D_1$. Fara (2005, pp. 47–8) discusses a case like this[8]: 'A glass in front of us is not protected before a time $t$. But a mighty sorcerer on a faraway planet starts to protect the glass at $t$ such that if it were to be struck, straight away she would intervene.' As I said before, it is undeniable that when the glass is not protected, it has $D_1$. I maintain though that when the glass is protected by the sorcerer it does not have $D_1$. Therefore, for me, the glass loses $D_1$ at $t$ as a result of the presence of the faraway sorcerer. But Fara will object that the presence or absence of a faraway sorcerer is not one of the right ways in which objects may lose or gain $D_1$. He will proceed to claim that the glass retains $D_1$ even after the sorcerer starts to protect it since the mere presence of the faraway sorcerer cannot take away $D_1$ from it. If so, it follows that, contra my view, a protected glass has $D_1$.

Unfortunately, however, I cannot see the point of Fara's objection. Fara seems to place great weight on the physical distance between the

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[7] Fara's following case fails for the same reason:

> If I were to ingest a substance with this disposition [the disposition to cause death when ingested] while having previously ingested an antidote, the substance would not cause my death—yet it would have undergone no intrinsic change, and would still have the disposition to cause death when ingested. It would therefore be a case of masking, and a counterexample to (even a sophisticated version of) the conditional account of disposition ascriptions. (Fara 2005, pp. 49–50)

It is easy to see that, according to (2), the disposition to cause death when ingested is not a nomically intrinsic disposition. If so, the substance in question may well lose the disposition to cause death in response to being ingested without its intrinsic properties changing. In consequence, despite Fara's view, it does not follow from the fact that it undergoes no intrinsic changes whilst I ingest an antidote, that it retains the disposition to cause death in response to being ingested. Fara's (2005, p. 50) case of kazoo is in effect the same with this case.

[8] Fara's own case is built on Martin's famous case of electro-finks, not on Bird's antidote case. But this makes no difference to my criticism.

sorcerer and glass. But the physical distance is irrelevant to the present issue. However distant the key may be from my front door, it is not strange at all to say that the key will lose the disposition to open my front door if I have changed the lock on my front. This is because the key's disposition to open my front door is not a nomically intrinsic disposition: its having that disposition does not wholly depend on its intrinsic properties and the laws of nature. By the same token, given that $D_1$ is not a nomically intrinsic disposition, it is not at all strange to say that the glass in question loses $D_1$ when the far-off sorcerer starts to protect it.

To wrap up, there is no reason whatsoever for accepting that $G_1$ has $D_1$. This means that the proponents of (SCA) are entitled to defend (SCA) against Bird's antidote case by saying that $G_1$ does not have $D_1$. But we have noted above that assuming that $G_1$ does not have $D_1$, Bird's antidote case does not spell trouble for (1). From this I conclude that Bird's antidote case fails to threaten (SCA).

## 3. Other criticisms

In the previous section, I argued that Bird's antidote case is unsuccessful. Other alleged counterexamples against (SCA) can be dealt with in the same way as Bird's antidote case. For instance, let us consider a variant of one of Martin's (1994) fink cases where a glass is struck but does not break because, quick as a flash, a sorcerer responds to the striking by casting a spell that renders it no longer fragile. In this case, because the glass would not break if struck, the analysans of (1) is not satisfied. But it is claimed that the glass has $D_1$, and therefore that the analysandum of (1) is satisfied. From this it follows that (1) does not provide a necessary condition for $D_1$.[9] But, by going through exactly the same reasoning as we did with respect to Bird's antidote case, we can easily see that there is no reason at all to believe that the glass has $D_1$. If so, we can defend (1) from Martin's fink case by saying that, just like $G_1$, the glass does not have $D_1$, and hence that the analysandum is not satisfied. Then, (1) is not in trouble with the fact that the glass does not satisfy the analysans of (1). Having said that, Martin's fink case poses no threat to (1).

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[9] The difference between Martin's fink case and Bird's antidote case is that in the first case the sorcerer would prevent the breaking of the glass by rendering the glass no longer fragile, whilst in the second case the sorcerer would do so by cancelling out the shock of the striking without rendering it no longer fragile.

To make my defense of (SCA) complete, let us consider another type of alleged counterexample to (SCA) which I will describe in detail for later purpose.

> *Smith's mimicker case* A piece of steel—call it 'S'—is struck and then breaks because the striking causes 'Z-rays' to be beamed on $S$, which in turn causes $S$ to break in a way fragile objects break when struck. In this case, $S$ would break if struck, which means that the analysans of (1) is satisfied. But it is claimed that $S$ does not have $D_1$. This entails that (1) does not provide a sufficient condition for $D_1$ (Smith 1977, pp. 444–5).

Smith's mimicker case is a mirror image of Bird's antidote case. My response to Smith's mimicker case is, accordingly, that there are no good reasons whatsoever to believe that $S$ does not have $D_1$. Admittedly, we have the intuition that the steel $S$ is not fragile. Assuming that fragility is not identical to $D_1$, however, it does not give us a good reason for thinking that $S$ does not have $D_1$. What is worse, we cannot appeal to the intrinsic nature of dispositions with a view to demonstrating that $S$ does not have $D_1$. For, as we have seen, $D_1$ is not a nomically intrinsic disposition. If so, the proponents of (SCA) can justifiably respond to Smith's mimicker case by saying that $S$ indeed has $D_1$. Then the analysandum of (1) is true of $S$, which means that (1) is not in trouble with the fact that the analysans of (1) is true of $S$. As a consequence, Smith's mimicker case does not threaten (1).

In summary, the alleged counterexamples that have been offered against the simple conditional analysis of $D_1$ do not work. We can generalize the above reasoning to cover such canonical dispositions as the disposition to cause death in response to being ingested and the disposition to dissolve in response to being submerged into water. For instance, we can overcome putative counterexamples against the simple conditional analysis of the disposition to cause death in response to being ingested by not ascribing it to a toxic object in an analogue to Bird's antidote case and by ascribing it to an atoxic object in an analogue to Smith's mimicker case.

So far I have dealt with counterexample-based criticisms against (SCA) and concluded that all of them prove unavailing. But there are other types of criticisms against (SCA) that do not involve counterexamples. One such criticism, raised by Fara, is worth our attention:

> According to (1), it is conceptually impossible that an object that is disposed to break in response to being struck is struck but does not break. But this is

absurd. As Bird's antidote case reveals, we must leave open the possibility that $x$ has $D_1$ and yet fails to break even though it is struck. (Fara 2005, p. 50)

We can easily recognize that Fara's criticism fails, though. As I have claimed earlier, the adherents of (SCA) are entitled to say that, in Bird's antidote case, $G_1$ does not have $D_1$; and hence that Bird's case is not a case where $x$ has $D_1$ but does not break when struck.

In general, it is not objectionable at all that it is conceptually impossible that a bearer of $D_1$ is struck but does not break; rather, this should be taken as an advantage of (1). It is beyond dispute that one of the important practical points of ascribing a dispositional property is that it enables us to predict the response its bearers will give when they are situated in an appropriate stimulating circumstance. For example, one of the practical points of ascribing fragility is that it facilitates predicting that its bearers will break when struck under suitable conditions; thereby, we can protect them if we wish. Likewise, the true ascription of being poisonous helps us predict that its bearers will cause death when ingested under suitable conditions; thereby, we can stay away from them if we wish. This constitutes the practical utility of the true ascription of being poisonous. This suggests that the true ascription of $D_1$ better serve the practical purpose of predicting the response its bearers will give when struck. (1) is in line with this suggestion since, according to (1), the true ascription of $D_1$ to an object, along with the fact that it is struck, entails that it breaks. Thanks to this entailment, being told that $x$ has $D_1$ and $x$ is struck, we can predict that $x$ will break. In general, according to (SCA), $x$'s being disposed to exhibit $m$ in response to being situated in $c$ entails that $x$ exhibits $m$ if situated in $c$. Thanks to this entailment, being told that $x$ is disposed to exhibit $m$ in response to being situated in $c$ and $x$ is situated in $c$, we can predict that $x$ will exhibit $m$. From this I conclude that, *pace* Fara, there is nothing wrong about the idea that it is conceptually impossible that a bearer of $D_1$ is struck but does not break.

To recapitulate, the current consensus among philosophers of dispositions notwithstanding, (SCA), as an analysis of canonical dispositions, stands up against the criticisms raised by them, whether they are based upon counterexamples or not. Further, as I will argue in the next section, (SCA) can be naturally developed into an adequate analysis of conventional dispositional properties.

## 4. Conventional dispositional properties

In the previous sections, I have examined cases that are alleged to be counterexamples to the simple conditional analysis of $D_1$ and concluded that they are not real counterexamples. These cases, however, originally concern the issue of how to analyse conventional dispositional properties, where, by conventional dispositional properties, I provisionally mean dispositional properties like fragility, water-solubility, and elasticity that correspond to simple predicates in English.[10] Indeed, in view of the fact that conventional dispositional properties are what we normally mean by dispositions *tout court*, the simple conditional analysis of dispositions will remain lame unless it gives rise to a workable account of conventional dispositions. It will therefore be of major importance to work out how to analyse conventional dispositional properties on the basis of (SCA). As we have seen earlier, under Lewis's two-step approach, (SCA) only analyses canonical dispositions by means of counterfactual conditionals. Hence it does not by itself provide an analysis of conventional dispositions. To get such an analysis on the basis of (SCA), we first need to define conventional dispositions in the overtly dispositional locution by specifying their specific stimulating circumstances and manifestations.

For the sake of argument, suppose that we tentatively define fragility into the disposition to break in response to being struck. Then (SCA) comes along and provides an analysis of fragility:

(3)  Something $x$ is fragile at time $t$ iff, if $x$ were to be struck at $t$, it would break.

Unfortunately, however, (3) is undermined by the cases described in the previous sections. For example, in Bird's antidote case, $G_1$ does not satisfy the analysans of (3). But it is intuitively unquestionable that $G_1$ is fragile. Moreover, in light of the fact that it is generally assumed that fragility is a nomically intrinsic disposition (Choi forthcoming), our intuition may well be bolstered by imagining an unprotected glass that is a nomic duplicate of $G_1$. For, given the intrinsic nature of fragility, we are entitled to infer the fragility of $G_1$ from the fragility of this unprotected glass. Thus, I take it that it is incontrovertible that $G_1$ is fragile, and therefore that the analysandum of (3) is satisfied. This means that (3) does not provide a necessary condition for fragility. Analogically,

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[10] This provisional characterization of conventional dispositions will prove wrong later. But it is good enough to serve as a makeshift for the present purpose.

Smith's mimicker case serves as a counterexample to the sufficiency of (3). This suffices to demonstrate that (3) is false.

However, this does not immediately mean that (SCA) is false as well. In fact, the proponents of (SCA) can cope with the cases at issue by replacing the rough and ready definition of fragility with the following definition (Choi 2006, p. 374):

(4)   Something $x$ is fragile at time $t$ iff $x$ has the disposition at $t$ to exhibit the fragility-specific manifestation in response to being situated in the fragility-specific stimulating circumstance

where the fragility-specific stimulating circumstance is something like a circumstance where $x$ is struck in the absence of fragility-antidotes, fragility-mimickers, and so on, whereas the fragility-specific manifestation is the event of breaking. A fragility-antidote is an entity like the sorcerer in Bird's antidote case that is extrinsic to a putatively fragile object and, if the object were to be struck, would abort the process of breaking without rendering it no longer fragile; and a fragility-mimicker is an entity like the Z-rays in Smith's mimicker case that is extrinsic to a putatively non-fragile object and would cause it to break through an indirect and non-standard process if it were to be struck.

(4) necessitates abandoning the rough and ready definition of fragility. It is clear that the fragility-specific stimulating circumstance differs from the $D_1$-specific stimulating circumstance: the former is, approximately, the event of being struck in the absence of fragility-antidotes, fragility-mimickers, and so on, whilst the latter is the simple event of being struck. If so, on the assumption that dispositional properties are individuated by their specific stimulating circumstances and manifestations, fragility is not identical to $D_1$, that is, the disposition to break in response to being struck. This means that the rough and ready definition of fragility should be rejected.

(SCA) and (4) jointly imply a new analysis of fragility:

(5)   Something $x$ is fragile at time $t$ iff, if $x$ were to be situated in the fragility-specific stimulating circumstance at $t$, then $x$ would exhibit the fragility-specific manifestation.

It is easy to see that none of the cases described above cause trouble for (5). For example, here is how (5) overcomes Bird's antidote case. The glass $G_1$ is not situated in the fragility-specific stimulating circumstance because a fragility-antidote, that is, the sorcerer is operative. Then (5) is not threatened by the fact that $G_1$ does not break since the antecedent of its analysans is not satisfied. Moreover, if $G_1$ were to be struck in the

absence of the sorcerer, then it would break. This means that if it were to be situated in the fragility-specific stimulating circumstance, it would exhibit the fragility-specific manifestation. If so, $G_1$ counts as being fragile by (5), which is a satisfying result. As a consequence, Bird's antidote case poses no threat to (5). The same holds for Smith's mimicker case.

I will now generalize this discussion to all conventional dispositions. We associate every conventional disposition with a characteristic stimulus and manifestation.[11] For instance, the characteristic stimulus and manifestation of water-solubility are the event of being submerged into water and the event of dissolving, respectively. The characteristic stimulus and manifestation of fragility are the event of being struck and the event of breaking, respectively. Here it is of great importance to bear in mind that by the characteristic stimulus of fragility I mean a different thing from the fragility-specific stimulating circumstance discussed above. The characteristic stimulus of fragility does not require the absence of fragility-antidotes, fragility-mimickers and so on. It is the simple event of being struck. Meanwhile, as already stated, by the fragility-specific stimulating circumstance I provisionally mean a circumstance where $x$ is struck in the absence of fragility-antidotes, fragility-mimickers, and so on. That said, for me, the characteristic stimulus of fragility is *distinct* from the fragility-specific stimulating circumstance. On the other hand, as we will see in more detail in section 6, by the characteristic manifestation of fragility, I mean the same thing as the fragility-specific manifestation. The characteristic manifestation of fragility, just like the fragility-specific manifestation, is the simple event of breaking.

For convenience, let the $D$-stimulus be the characteristic stimulus of a conventional disposition $D$ and let the $D$-manifestation be the characteristic manifestation of $D$. Then the $D$-specific stimulating circumstance is tentatively defined to be a circumstance where $x$ undergoes the $D$-stimulus in the absence of $D$-antidotes, $D$-mimickers, and so on. Here a $D$-antidote is an entity that is extrinsic to a putative bearer x of $D$ such that if $x$ were to undergo the $D$-stimulus it would abort the process of the $D$-manifestation without depriving $x$ of $D$; and a $D$-

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[11] Here I assume that conventional dispositions are associated with unique pairs of characteristic stimulus and manifestation, that is, singly manifested dispositions. But it is well-known that some conventional dispositions such as the property of courage and the property of electric charge are associated with more than one pair of characteristic stimulus and manifestation, that is, multiply manifested dispositions. Therefore, my subsequent discussion must be understood to be confined to singly manifested dispositions. I believe though that it is an easy step to extend it to multiply manifested dispositions.

mimicker is an entity that is extrinsic to a putative bearer $x$ of $D$ such that it would cause x to exhibit the $D$-manifestation through an indirect and non-standard process if $x$ were to undergo the $D$-stimulus. On the other hand, the $D$-specific manifestation is identical to the $D$-manifestation.

To generalize (4), something $x$ has a conventional disposition $D$ at time $t$ iff $x$ has the disposition at $t$ to exhibit the $D$-specific manifestation in response to being situated in the $D$-specific stimulating circumstance. This joins with (SCA) to imply the following analysis of a conventional disposition $D$:

  (6)  Something $x$ has a conventional disposition $D$ at time $t$ iff, if $x$
       were to be situated in the $D$-specific stimulating circumstance
       at $t$, then $x$ would exhibit the $D$-specific manifestation.

To a first approximation, this is to say that $x$ has $D$ at $t$ iff, if $x$ were to undergo the $D$-stimulus in the absence of $D$-antidotes, $D$-mimickers, and so on at $t$, it would exhibit the $D$-manifestation.

For instance, as stated above, the water-solubility-stimulus and water-solubility-manifestation are the event of being submerged into water and the event of dissolving, respectively. Therefore, the water-solubility-specific stimulating circumstance is a circumstance where $x$ is submerged into water in the absence of water-solubility-antidotes, water-solubility-mimickers, and so on, whilst to exhibit the water-solubility-specific manifestation is to dissolve in water. If so, $x$'s being water-soluble is analysed into the counterfactual conditional that $x$ would dissolve if submerged into water in the absence of water-solubility-antidotes, water-solubility-mimickers, and so on.

The specification of the $D$-specific stimulating circumstance includes the absence of $D$-antidotes, $D$-mimickers, and the like. Hence if a bearer of $D$ were to be situated in the $D$-specific stimulating circumstance, it would not be the case that it does not manifest $D$ owing to the operation of a $D$-antidote. By the same token, if an object that does not have $D$ were to be situated in the $D$-specific stimulating circumstance, it would not be the case that the object manifests $D$ owing to the operation of a $D$-mimicker. This entails that (6) does not suffer from Bird's antidote case or Smith's mimicker case. As a consequence, we have gotten a viable version of the simple conditional analysis of conventional dispositions. In fact, (6) will serve as a template for a more refined analysis of conventional dispositions which I will set out in the following sections.

Finally, one disclaimer is in order here. I do not claim that *all* 'covert dispositions' are analysed along the line of (6), where, by covert dispositions, I understand those dispositions that are not explicitly couched in the overtly dispositional locution. Suppose that we coin a new term 'bragility' and define it to be the disposition to break in response to being struck. Bragility is a legitimate disposition, as can be seen from the fact that it has all features of dispositionality such as those considered by McKitrick.[12] Further, it is a covert disposition as it is not explicitly expressed in the overtly dispositional locution. But it is clear that the dispositional property of bragility is not subsumed under the scheme of (6). The characteristic stimulus and manifestation of bragility would be the events of being struck and breaking, respectively. Therefore, to be subsumed under the scheme of (6), $x$'s being bragile at $t$ must be defined to be the disposition to exhibit the bragility-specific manifestation in response to being situated in the bragility-specific stimulating circumstance, where the bragility-specific stimulating circumstance is approximately a circumstance where $x$ is struck in the absence of bragility-antidotes, bragility-mimickers, and so on; and the bragility-specific manifestation is the simple event of breaking. But we have introduced the term 'bragile' by defining bragility to be the disposition to break in response to being struck. And, the disposition to break in response to being struck is distinct from the disposition to exhibit the bragility-specific manifestation in response to being situated in the bragility-specific stimulating circumstance. Among other things, they involve different stimulating circumstances. Even if $x$ is struck, this does not mean that it is situated in the bragility-specific stimulating circumstance; to be situated in the bragility-specific stimulating circumstance, $x$ must be struck *in the absence of bragility-antidotes, bragility-mimickers, and so on*. That being said, it is incorrect to define bragility to be the disposition to exhibit the bragility-specific manifestation in response to being situated in the bragility-specific stimulating circumstance. This brings us to the conclusion that the dispositional property of bragility is not amenable to (6).

(6) is not intended to provide an analysis of all covert dispositions but only an analysis of all conventional dispositions, where not all covert dispositions are conventional dispositions. Bragility is one example that is a covert disposition but not a conventional disposition. Then

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[12] McKitrick's (2003, p. 157) four marks of dispositionality are as follows: (1) a dispositional property $P$ has a characteristic manifestation; and (2) there are circumstances that would typically bring about the occurrence of this manifestation; and (3) there is a certain counterfactual conditional that is typically true of things that possess $P$; and (4) $P$ is named by the overtly dispositional locution.

exactly what are conventional dispositions? I can give a number of stock examples of conventional dispositions: water-solubility, conductivity, fluidity, irascibility, elasticity, courage, and so forth. But it is not easy to give an appropriate characterization of conventional dispositions. In the above I tentatively characterized conventional dispositions as those dispositions that correspond to simple predicates in English. But this tentative characterization is not satisfactory at all. It is unreasonable to say that the applicability of (6) to a disposition depends upon whether or not it happens that there is a corresponding simple predicate in our language. For example, we can conceive of dispositions that correspond to no simple predicates in English but should be analysed along the line of (6). So, the rough and ready characterization of conventional dispositions must go. Perhaps we can employ (6)—or its further refinement I will propose in the next section—as a characterization of conventional dispositions once it is firmly established: conventional dispositions are those dispositions that are subsumed under the scheme of (6). Having said that, my claim of the adequacy of (6) amounts to the claim that some important dispositions like those I mentioned above, which can be found in science or everyday life, are conventional dispositions as characterized by (6).[13]

## 5. The disposition-specific stimulating circumstance

I have thus far developed (SCA) into an analysis of conventional dispositions, namely, (6) by introducing the concepts of $D$-specific stimulating circumstance and manifestation. But the exact specification of the $D$-specific stimulating circumstance and manifestation is one of the hard remaining problems in making (6) entirely acceptable. Note that the sketchy specification of the $D$-specific stimulating circumstance in terms of $D$-antidotes, $D$-mimickers, etc. that I have offered in the foregoing is not satisfactory. It seems to me that we can define the concept of fragility-antidote only by invoking the very dispositional concept, *fragility*. If so, given that (6) analyses the concept of fragility in terms of the fragility-specific stimulating circumstance, we end up with a big conceptual circle. In general, the sketchy specification of the $D$-specific stimulating circumstance in terms of $D$-antidotes, $D$-mimickers, and so on renders (6) circular, which means that it is not acceptable.[14] One

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[13] I agree with Bennett's following statement: 'In philosophy we often have to start with rough criteria—or even a mere ostensive list—to pick out a lot of members of some class, develop an analytic account of how they work, and treat that as implicitly defining that class' (Bennett 2003, pp. 4–5).

might attempt to characterize conditions required to obtain by the fragility-specific stimulating circumstance without reference to the concept of fragility and provide an exhaustive list of such conditions: the fragility-specific stimulating circumstance is a circumstance where *x* is struck in the absence of Bird's sorcerer, Martin's sorcerer, Smith's *Z*-rays, etc. As Mumford (2001, pp. 375–6) rightly claims, though, no matter how many conditions we list, we cannot possibly preclude every interfering extrinsic factor. Therefore, it is not possible to provide an exhaustive list of such conditions.

Indeed, to specify the *D*-specific stimulating circumstance and manifestation in full is a daunting problem. It has its analogues in Mumford's (1998, pp. 87–91; 2001, pp. 376–7) 'ideal conditions', Malzkorn's (2000, pp. 457–9) 'normal conditions', and Bird's (1998, pp. 233–4; 2000, p. 233) 'normal circumstances'. However, none of them actually provide a detailed solution to this problem. In this regard, I argued in Choi 2003 (p. 578) that the proponents of the simple conditional analysis of dispositions do not have the burden of specifying the concepts of *D*-specific stimulating circumstance and manifestation in full. This is due to Lewis's (1997, p. 146) idea that since to specify those concepts 'affords no lesson about dispositionality in general', it poses no serious problem for those proponents that, due to the lack of such a specification, they are not able to provide a detailed analysis of *D*.

Now, however, I have changed my mind and believe that the concepts of *D*-specific stimulating circumstance and manifestation need an adequate specification. First of all, the success of (6) crucially depends on exactly what are included in the specification of the *D*-specific stimulating circumstance and manifestation. For instance, (6)—or (5)—has no chance of success unless the specification of the fragility-specific stimulating circumstance includes that there are no sorcerers envisaged by Bird. Therefore, once we are aiming at providing an adequate analysis of a conventional disposition *D*, we need to specify the concepts of *D*-specific stimulating circumstance and manifestation properly. Secondly, there is a good sense in which to specify the concepts of *D*-specific stimulus and manifestation affords a significant lesson about dispositionality in general. As I have already presented, to a first approximation, the *D*-specific stimulating circumstance is a circumstance where *x* undergoes the *D*-stimulus in the absence of *D*-antidotes, *D*-mimickers, and so on, whilst the *D*-specific manifestation is the same with the *D*-manifestation. This being the case, when we let D and

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[14] Of course, this does not mean that (6) is useless since it can still help us improve our knowledge of what dispositional predicates apply to (Mellor 2000, p. 763).

D* be two different dispositional properties, the *D*-specific stimulating circumstance and manifestation are specified in exactly the same manner as the *D**-specific stimulating circumstance and manifestation. This indicates that the sketchy specification of the *D*-specific stimulating circumstance and manifestation does not wholly depend on the peculiarities of *D*. Thus it is wrong to say that the specification entirely belongs to the merely pragmatic topic of what qualifications individual dispositional concepts impose on their respective stimulating circumstances and manifestations. In fact, I believe that making clear the concepts of *D*-specific stimulating circumstance and manifestation sheds an interesting, indeed important, metaphysical light on the nature of dispositionality. Once this is seen, it is unreasonable to say that there is no need to give an adequate specification of the *D*-specific stimulating circumstance and manifestation. Keeping this in mind, I will first take a look at exactly how to specify the concept of *D*-specific stimulating circumstance, and then carry on to the concept of *D*-specific manifestation.

A filament would glow only if it is in vacuum or something similar to it. Hence, when a particular filament glows, there is a good sense in which it glows in virtue not only of its own intrinsic properties and the laws of nature but also of its extrinsic conditions. By the same token, an inflammable object would catch fire if ignited only if it is surrounded by a profusion of oxygen molecules. Therefore, there is a good sense in which an inflammable object would catch fire if ignited in virtue not only of its own intrinsic properties and the laws of nature but also of its extrinsic conditions. This indicates that the counterfactual conditional that is associated with a conventional disposition *D* must be that a bearer of *D* would exhibit the *D*-manifestation if subject to the *D*-stimulus *under certain extrinsic conditions*. For example, *x* is inflammable iff it would catch fire if ignited under certain extrinsic conditions.

Then what extrinsic conditions are conceptually connected to *D*? The answer to this question arises from the utility of our conventional dispositional concepts. The concept of water-solubility is useful in our everyday life in that we can distinguish everyday items by using the concept of water-solubility and predict what would happen to them if they were to be submerged in water. Here it is important to realize that, given that we handle everyday items under the ordinary conditions, we are concerned about what would happen to them under ordinary conditions. We do not care about what would happen to them under some outlandish and far-fetched conditions. Then we expect the concept of water-solubility to sort things in terms of what would happen to them

under the ordinary conditions. For instance, sugar would not dissolve if submerged in water under the far-fetched conditions where Maxwell's demon interferes with the molecular process.[15] But this does not deter us from maintaining that sugar is water-soluble. This, I take it, is due to the fact that the concept of water-solubility is employed to sort things in terms of whether $x$ would dissolve if submerged in water under the ordinary conditions: sugar would dissolve if submerged in water under the ordinary conditions despite the fact that it would not if submerged in water under some extraordinary conditions. With this in mind, I submit that what we mean by saying that an object is water-soluble is that it would dissolve when submerged in water under the ordinary extrinsic conditions. This leads us to the idea that to be situated in the water-solubility-specific stimulating circumstance is to be submerged in water under the ordinary conditions. In general, for a conventional disposition $D$, the $D$-specific stimulating circumstance is a circumstance where $x$ undergoes the $D$-stimulus *under the ordinary conditions.*

It is to be noted that the ordinary conditions need to be relativized to the dispositional property $D$. So, the ordinary conditions are always ordinary conditions for a dispositional property; and the ordinary conditions for a dispositional property may be different from those for another dispositional property. For example, the ordinary conditions for superconductivity are quite different from the ordinary conditions for fragility. The former will arguably include that the temperature is extremely low. Meanwhile, many philosophers of dispositions would say, should the ordinary conditions for fragility include that the temperature is extremely low, the concept of fragility would become useless because almost every object would turn out to be fragile. On my view, the superconductivity-specific stimulating circumstance is a circumstance where $x$ is connected to an electric source under the ordinary conditions for *superconductivity*; the fragility-specific stimulating circumstance is a circumstance where $x$ is struck under the ordinary conditions *for fragility*; the ordinary conditions for superconductivity differ from the ordinary conditions for fragility. In general, I propose that, for a conventional disposition $D$, the $D$-specific stimulating circumstance is a circumstance where $x$ undergoes the $D$-stimulus under the ordinary conditions for $D$.

If so, what are the ordinary conditions for $D$? I suggest that they can be best understood to be conditions extrinsic to the putative bearer of $D$ that are ordinary to those who possess the corresponding dispositional concept. Thus understood, what I mean by the ordinary condi-

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[15] This case is due to Bird (1998, p. 231).

tions for fragility are extrinsic conditions that are ordinary to the possessors of the dispositional concept of fragility. Most people in the street know how to use the concept of fragility in sorting things or in drawing inferences, and we can therefore say that they possess the concept of fragility. Therefore, the ordinary conditions for fragility are extrinsic conditions that are ordinary to people in the street. Meanwhile, most folk have no opportunity to encounter phenomena of superconductivity and do not know how to use the concept of superconductivity in classifying things or in drawing inferences. We therefore have to say that most people in the street do not possess the dispositional concept of superconductivity. Consequently, I maintain that the ordinary conditions for superconductivity may not be ordinary to people in the street. Note that the concept of superconductivity is possessed by a small number of physical scientists. If so, on my view, the ordinary conditions for superconductivity are extrinsic conditions that are ordinary to those physical scientists.

This consideration obviates one possible objection to the concept of ordinary condition. Mumford says:

> The reason for preferring ideal to [Malzkorn's] normal conditions is that disposition ascriptions can sometimes be made in quite abnormal conditions, as when we say things are fragile at very low temperatures … . The speculation appeals to me that much of what we call technology depends on setting up some artificial environment, some ideal conditions, in which an object or substance can manifest dispositions which it would not manifest in a state of nature. Some examples: oil will yield petrol, but only during a carefully controlled manufacturing process; … (Mumford 2001, pp. 375–8)

The gist of Mumford's objection to the concept of normal condition is that many scientific dispositions would manifest only under quite abnormal conditions, and therefore that we should not require them to manifest under normal conditions. Given that normal conditions do not look different from ordinary conditions, it might be thought, if Mumford's objection to the concept of normal condition works, then it equally applies to my concept of ordinary condition.

But this is not the case. I agree with Mumford that some scientific dispositions would manifest only under quite extraordinary conditions. On my view, this means merely that the ordinary conditions for those scientific dispositions are not ordinary to people in the street. However, they are ordinary to those who possess the corresponding dispositional concepts, namely scientists. For example, the extrinsic conditions under which oil's dispositions would manifest are ordinary to oil scientists. Likewise, the extrinsic conditions under which super-

conductivity would manifest are ordinary to cryophysicists. In short, although some scientific dispositions would not manifest under extrinsic conditions that are ordinary to people in the street, they would manifest under extrinsic conditions that are ordinary to those who possess the corresponding dispositional concepts. This being the case, Mumford's objection to the concept of normal condition does not apply to my concept of ordinary condition.

The next point I will bring up is that my proposal to specify the *D*-specific stimulating circumstance in terms of the ordinary conditions for *D* is a natural improvement over the rough and ready specification of the *D*-specific stimulating circumstance in terms of *D*-antidotes, *D*-mimickers, and so on. The main motivation for the second is equally a good motivation for the first, whilst the first, unlike the second, does not incur a problem of circularity. To begin with, the main motivation for the idea of ruling out *D*-antidotes, *D*-mimickers, and so on from the *D*-specific stimulating circumstance is that this idea, along with (SCA), provides an analysis of *D* that is not in trouble with such problematic cases as Bird's antidote case and Smith's mimicker case. It will be shown below, though, that the same motivation can be given to my proposal to specify the *D*-specific stimulating circumstance in terms of the ordinary conditions for *D*.

On my proposal, assuming that the *D*-specific manifestation is the same with the *D*-manifestation, (6) is equivalent to the following:

(7)   Something *x* has a conventional disposition *D* at time *t* iff, if *x* were to undergo the *D*-stimulus at *t* under the ordinary conditions for *D*, then *x* would exhibit the *D*-manifestation.

I propose that (7) is an adequate analysis of a conventional disposition *D*. It is clear that (7) gets both Bird's antidote case and Smith's mimicker case right. The sorcerer in Bird's antidote case is ruled out from the ordinary conditions for fragility. This is because, in most cases that we come across where striking leads to breaking, no sorcerer like the one in Bird's antidote case can be found. In addition, $G_1$ would break if struck in the absence of the sorcerer, which means that (7) delivers the right verdict that $G_1$ is fragile. By the same token, the Z-rays in Smith's mimicker case are excluded from the ordinary conditions for fragility because they cannot be found in the majority of cases that we encounter where striking brings about breaking; and the steel *S* would not break if struck in the absence of the Z-rays. This means that (7) delivers the right verdict that *S* is not fragile. That being said, (7) has no difficulty in handling Bird's antidote case and Smith's mimicker case. As a

consequence, my proposal to specify the *D*-specific stimulating circumstance in terms of the ordinary conditions for *D* deals with such problematic cases as Bird's antidote case and Smith's mimicker case as well as the rough and ready specification of the *D*-specific stimulating circumstance in terms of *D*-antidotes, *D*-mimickers, and so on. This means that the key motivation for the second equally motivates the first.

But it may be objected that the first is not an improvement over the second because the first, just like the second, is beset with a problem of circularity: 'At least at first blush, we cannot spell out the ordinary conditions for fragility without making reference to the very dispositional property of *fragility*. Therefore, the dispositional property of fragility cannot be analysed in terms of the ordinary conditions for fragility on pains of circularity.' But I think that this objection is mistaken. As already stated, the ordinary conditions for *D* are extrinsic conditions that are ordinary to those who possess the corresponding dispositional concept. Thus understood, I maintain, no problem of circularity arises. It is to be observed that we have gotten no satisfactory account of fragility yet but we are none the less sure that we possess the concept of fragility.[16] This is because we can identify the possessors of the concept of fragility without appealing to such an account of fragility. For example, we can do that by relying on epistemic capacities such as the ability to sort things and draw inferences. This observation is naturally associated with the position that concept possession is, in fact, constituted by those epistemic capacities, which Fodor (2004) calls 'concept pragmatism'. Fodor himself, considering concept pragmatism as the cornerstone of the contemporary philosophy of mind and language, rejects it in favour of concept Cartesianism. However, as suggested by many other philosophers such as Peacocke, Weiskopf, and Bechtel, I think, Fodor's criticisms of concept pragmatism are not conclusive at all.[17]

On the assumption of concept pragmatism, however, we can give an epistemic account of the possessors of a concept *C* without presupposing a conceptual account of *C*. Hence, given that the ordinary conditions for a disposition *D* are understood to be extrinsic conditions that

[16] This is not uncommon in other areas of philosophy. Notwithstanding the absence of an adequate account of causation, we cast no doubt on the fact that we possess the concept of causation. By the same token, without a satisfactory account of knowledge, we do not doubt that we possess the concept of knowledge. Just as in the case of fragility, this is because we can tell who possess such concepts as causation and knowledge without giving conceptual accounts of them. I am indebted to Huw Price for this point.

[17] See the special issue of *Mind and Language* (Vol. 19, No. 1, 2004) devoted to concept pragmatism.

are ordinary to those who possess the dispositional concept of *D*, the analysans of (7) requires no knowledge of a conceptual account of *D*. For instance, therefore, without necessarily presupposing any knowledge of a conceptual account of fragility, we can determine whether *x* would break if struck under the extrinsic conditions that are ordinary to the possessors of the concept of fragility. As a consequence, the idea of specifying *D*-specific stimulating circumstance in terms of the ordinary conditions for *D*, unlike the idea of specifying it in terms of *D*-antidotes, *D*-mimickers, and so on, is not subject to the charge of circularity. From this I come to the conclusion that the suspicion of circularity can be substantially abated.

Another possible criticism I would like to address is that the ordinary conditions for a disposition *D* are just those conditions in which a bearer of *D* would exhibit the *D*-manifestation if it were to undergo the *D*-stimulus. If this criticism is accurate, then it will be *vacuously* true that a bearer of *D* would exhibit the *D*-manifestation if it were to undergo the *D*-stimulus under the ordinary conditions for *D*, and (7) therefore will throw no interesting light on the nature of dispositionality. But I believe that this criticism does not hit home. As I said earlier, the ordinary conditions for fragility are characterized as conditions extrinsic to the putatively fragile object that are ordinary to the possessors of the dispositional concept of fragility. Thus characterized, the ordinary conditions for fragility do not entail that it is trivially true that a fragile object would break if struck under the ordinary conditions for fragility.

Indeed, quite plausibly, it might be contended that, in cases where extrinsic interfering factors are so prevalent that they are not ruled out from the ordinary conditions for *D*, even a bearer of *D* would not exhibit the *D*-manifestation if it were to undergo the *D*-stimulus under the ordinary conditions for *D*; and hence that (7) is unsuccessful. Thus Dan Ryder (MS) has put forward something similar to the following argument:

> Suppose that scientists discover that, as a matter of fact, steel would break if struck except when surrounded by a certain element $E_s$ pervasive in air and that it is due to the operation of $E_s$ in air that steel does not break when struck. Given that $E_s$ is widespread in air, the ordinary conditions for fragility include that $E_s$ is operative. Then steel would not break in virtue of the operation of $E_s$ if struck under the ordinary conditions for fragility. Hence, it follows that the scientific discovery makes no difference to the fact that the analysans of

(7) for fragility is not satisfied of steel. On the face of it, however, it sounds plausible to say that, on the supposition at issue, steel is fragile. After all, it has been discovered that steel does not break as a result of the operation of the *extrinsic* factor $E_s$. If so, steel, which is fragile, would not break if struck under the ordinary conditions for fragility, which means that (7) is false.

I hold that this objection to (7) eventually turns out to misfire as I will expound below. But the objection is seemingly plausible enough to convince us that it is not reasonable at all to say that (7) is vacuously true. Should (7) be vacuously true, no such plausible objection could ever be raised against (7). Turning to the validity of the objection under consideration, I suggest, even if it has been discovered that steel does not break in virtue of the operation of the extrinsic factor $E_s$, this will make no difference to the fact that steel is not fragile. We will continue to maintain that steel is not fragile. After all, the discovery will not reduce the mileage of refraining from ascribing fragility to steel at all. We will still need to distinguish steel from other stuffs that are likely to break in our everyday life; and the concept of fragility is very useful to this end. Hence, as long as steel does not break under the ordinary conditions, for example, we will still refrain from attaching a fragility tag to a bag when it only contains steel products. This suggests that, on the supposition under discussion, it does not serve any practical purpose at all to attribute fragility to steel in the least. If so, in spite of the scientists' discovery, we would continue to say that steel is not fragile.

It is remarkable that there are realistic cases that confirm my contention. Food scientists have discovered that milk would kill human beings if ingested except when it is metabolized by the enzyme lactase. Without such metabolism, the milk consumers would be suffering from lactic acid poisoning, which would eventually kill them. Fortunately, however, the enzyme lactase abounds in their bodies under the ordinary conditions. As a result, they do not die of drinking milk.[18] Given the food scientists' discovery that milk does not kill because of the operation of the enzyme lactase, do we need to change our opinion that milk is not a poison? Not at all! On being informed of the scientific discovery, *nobody* would ever say that milk is a poison. We would still need to distinguish food items in terms of what would happen if they were ingested under the ordinary conditions where the enzyme lactase is abundant in our bodies. The concept of poison is expected to do service for such a distinction. The news of the discovery does not therefore

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[18] This case is due to Bird (1998, p. 231).

change our opinion that milk is not a poison as long as milk does not kill under the ordinary conditions.[19]

The analogy between the case of $E_s$ and the case of milk gives us an additional reason to accept that the scientific discovery of $E_s$ would not lead us to change our opinion that steel is not fragile. If so, it is pretty incontestable that steel in the case of $E_s$ is not fragile. That said, the case of $E_s$ does not exemplify that a fragile object does not satisfy the analysans of (7) for fragility. Then we are led to the conclusion that though the case of $E_s$ is plausible enough to eliminate the suspicion that (7) is vacuously true it does not really spell trouble for (7). In fact, it provides support to (7) since our tendency to refuse to change our opinion that steel is not fragile can be explained by referring to the fact that, no matter what scientists discover, steel does not satisfy the analysans of (7) for fragility.

The same conclusion can be reached for a case where scientists are supposed to discover that, as a matter of fact, glass would not break if struck except when surrounded by $E_f$ pervasive in air and that it is owing to the operation of $E_f$ that glass breaks when struck. Even in that case we would not change our opinion that glass is fragile. It would still be much more useful to continue to attribute fragility to glass than not to do so. Again, there are realistic cases corresponding to this case. Chemists found that a dry match would not catch fire if ignited except when it is surrounded by oxygen prevalent in air. But this chemical discovery has not made difference to our belief that a dry match is inflammable.[20] In light of this consideration, it is to be accepted that, even if informed of the discovery of $E_f$, we would continue to think that glass is fragile. This is vindicated by (7) because the discovery of $E_f$ makes no difference to the fact that glass counts as being fragile by (7). To wrap up, (7) has no trouble dealing with cases where extrinsic interfering factors are prevalent.

The last criticism I will counter is that (7) has difficulty in handling the fragility of a super-cooled piece of steel.[21] It is a well-known scientific fact that if a piece of steel, which is not fragile at a room tempera-

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[19] This is in accord with (7). (7) rules that milk is not a poison since it would not cause death if ingested under the ordinary conditions for being poisonous where the enzyme lactase is present. Further, this ruling is not affected by the food scientists' discovery that milk would cause death if ingested under the extraordinary conditions where the enzyme lactase is absent.

[20] Since a dry match would catch fire when ignited under the ordinary conditions for inflammability where oxygen is widespread, (7) correctly rules that a dry match is inflammable. This is not affected by the chemical discovery under discussion. Hence this case is another confirming instance for (7).

[21] I thank the anonymous referee for bringing this criticism to my attention.

ture, has been cooled down to an extremely low temperature it will become fragile. Let us consider a piece of steel that has been at a low enough temperature for a sufficient time—for short, call it Chilly. As I stated before, the ordinary conditions for fragility are extrinsic conditions that are ordinary to the possessors of the dispositional concept of fragility. They therefore include that the ambient temperature is a room temperature. If so, one might advance the following criticism of (7):

> What if Chilly were heated up to a room temperature? It would lose its fragility because it is fragile only at an extremely low temperature. Then it follows that if Chilly were to be struck under the ordinary conditions for fragility, then it would lose its fragility; thereby it would not break. This entails that Chilly does not come out fragile by (7). But this flies in the face of our scientific knowledge.

I admit that *prima facie* this criticism sounds plausible, which once more corroborates the claim that (7) is not vacuously true. Again, however, I take it that it is not accurate. My first response is based on the observation is that, according to the normal ways of the actual world, Chilly would not lose fragility *instantly* even if it is situated at a room temperature. When it is situated at a room temperature, its own temperature begins to increase; and this causes its microstructure to change; thereby, it will eventually lose its fragility. What is important here is that it takes some time for Chilly to lose its fragility. This means that there would be a little time after Chilly is situated at a room temperature and before it loses its fragility. During this time interval, Chilly would break if struck. Once this is seen, it is reasonable to suggest that Chilly would break if struck shortly after it is situated at a room temperature. As a consequence, Chilly would break if struck under the ordinary conditions for fragility that include that the ambient temperature is a room temperature, which entails that, according to (7), Chilly is fragile. This is to say that the criticism under discussion misfires.

It might be objected though that, although perhaps my first response is successful in countering the criticism as it stands, it does not completely address the fundamental concern brought out by the criticism. To give content to this objection, let us assume that if Chilly is situated at a room temperature, it will lose its fragility instantly. Admittedly, this assumption is not empirically adequate. As already noted, what is true in the actual world is that if Chilly is situated at a room temperature, it will take some time for Chilly to lose its fragility. But the empirical adequacy of the assumption in question is not needed for the critics of (7). Given that (7) is designed to give a conceptual account of conventional

dispositions, it is successful only if it is true not only in the actual world but also in *all conceptually possible worlds*. Hence the critics of (7) may well help themselves to the assumption in question as long as it is conceptually possible; and undoubtedly it is conceptually possible that if Chilly is situated at a room temperature, straight away it will lose its fragility. Now the criticism proceeds in this way:

> What if Chilly were struck at a room temperature? On the assumption that if Chilly is situated at a room temperature it will lose its fragility instantly, it would not break if struck at a room temperature. Therefore, Chilly would not break if struck under the ordinary conditions for fragility, which entails that Chilly is not fragile according to (7). But the assumption at issue does not undermine our intuition that it is fragile. This means that it serves as a counterexample against (7).

I take it though that the assumption at issue *does* undermine our intuition that Chilly is fragile. It is true that Chilly would not break if struck under the ordinary conditions for fragility. In this case, however, Chilly would behave in exactly the same way as a non-fragile thing would if struck under the ordinary conditions. If so, there is no need for us to distinguish it from other non-fragile things in so far as we are interested to sort things in terms of what would happen to them if struck under the ordinary conditions. Indeed we may treat it like a run-of-the-mill non-fragile thing in the sense that, for instance, we do not need to take special care to protect it from breaking. Once this is recognized, it is not unreasonable to maintain that Chilly is not fragile in the first place—of course, on the empirically inadequate assumption that if Chilly is situated at a room temperature it will lose its fragility instantly.

Recall that Chilly is supposed to be currently at an extremely low temperature. Admittedly, therefore, it would break if struck under the conditions where it is currently situated, that is, under the conditions where the temperature of its environment is extremely low. On (SCA), however, this means merely that Chilly is disposed to break in response to being struck under its current conditions. I hold though that fragility is *distinct* from the disposition to break in response to being struck under $x$'s current conditions. For instance, recall that in Smith's mimicker case $Z$-rays are supposed to be presently operative. Therefore, on (SCA), the piece of steel $S$ in Smith's case is disposed to break in response to being struck under the conditions where it is currently situated, that is, under the conditions where $Z$-rays are operative; yet it is unquestionable that it is not fragile. This reveals that fragility should be

distinguished from the disposition to break in response to being struck under $x$'s current conditions. This being the case, we cannot derive Chilly's being fragile from the fact that Chilly would break if struck under its current conditions.

On my view, it is strictly misleading to describe the behaviour of Chilly by saying that if Chilly is situated at a room temperature, straight away it will lose its fragility. For, Chilly cannot lose fragility because it is not fragile in the first place. A more precise description of Chilly's behaviour is this: Chilly has a certain type of microstructure $M$ that can be typically found in fragile things. This microstructure $M$ is such that if Chilly were to be struck and it were to retain $M$ for a sufficient time, it would break. But Chilly also has the intrinsic disposition to lose $M$ instantly in response to being situated at a room temperature. As a consequence, if Chilly were struck under the ordinary conditions for fragility that include that the ambient temperature is a room temperature, it would lose $M$ instantly in virtue of one of its intrinsic dispositions; as a result of this, it would not break.

This redescription, I take it, makes it possible to provide an additional justification for my claim that Chilly is not fragile. Let us consider a slight modification of Martin's fink case described in section 3. Suppose that a bizarre object $O$ has exactly the same intrinsic properties as a fragile glass except that $O$, not the fragile glass, has the intrinsic disposition to instantly lose $M^*$ in response to not being protected by a sorcerer, where $M^*$ is the type of microstructure that $O$ shares with the fragile glass. Suppose further that it is currently protected by a sorcerer who would instantly take $M^*$ away from it if it were struck. On this supposition, the microstructure $M^*$ is such that if $O$ were to be struck and it were to retain $M^*$ for a sufficient time, it would break. But $O$ also has a strange intrinsic disposition to lose this microstructure $M^*$ instantly when it is not protected by the sorcerer. On the one hand, therefore, if it were struck in the absence of the sorcerer, it would lose $M^*$ instantly as a result of the operation of one of its intrinsic dispositions; thereby it would not break. On the other hand, if it were struck in the presence of the sorcerer, it would lose $M^*$ instantly as a result of the sorcerer's interference; thereby it would not break. In consequence, whether protected or not, it would not break if struck. In this case, I take it, it is highly intuitive to say that $O$ is not fragile as it has no chance to break at all, whether it is protected by the sorcerer or not.[22]

In Martin's fink case where a fragile glass is protected by a sorcerer, on the one hand, there is no question about the fragility of the glass. On the other hand, we noted that, in the modification of Martin's fink case

presented above, we are inclined to think that the object $O$ is not fragile. What makes this difference between the two cases? They are the same with respect to the fact that an object with the microstructure $M^\star$ is protected by a sorcerer. Their difference is this: in Martin's fink case, the glass does not have the intrinsic disposition to lose $M^\star$ immediately in response to not being protected by a sorcerer, whereas in the modification of Martin's fink case, $O$ does. If so, the best explanation of our inclination to think that $O$ is not fragile would be that, unlike the glass in Martin's fink case, it has the intrinsic disposition to lose $M^\star$ immediately in response to not being protected by a sorcerer. But the sorcerer would be ruled out from the ordinary conditions for fragility. This leads to the idea that we can explain why $O$ is not fragile by referring to the fact that $O$ has the intrinsic disposition to lose $M^\star$ immediately in response to being situated in the ordinary conditions for fragility. But this feature of the modification of Martin's fink case can be found in the case of Chilly as well: Chilly has the intrinsic disposition to lose $M$ immediately in response to being situated in the ordinary conditions for fragility.[23] Once this is recognized, it is sensible to suppose that Chilly is not fragile. Unless Chilly is fragile, however, (7) is not in trouble with the fact that its analysans for fragility is not true of Chilly. To wrap up, (7) has no problem with a super-cooled piece of steel, which reveals that the criticism under discussion proves unavailing.

## 6. The disposition-specific manifestation

I have thus far justified (7) in respect of the $D$-specific stimulating circumstance: (7) gets right such problematic cases as Bird's antidote case and Smith's mimicker case and, at the same time, gets round the problems of circularity, trivialization, pervasive extrinsic interference, and so on. To make (7) fully acceptable, though, I need to justify (7) in respect of the $D$-specific manifestation. In this connection, I claimed above that, for a conventional disposition $D$, the $D$-specific manifestation is the same event with the $D$-manifestation. For example, the fragility-specific manifestation is the event of breaking; and the water-

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[22] In Choi 2005b (pp. 499–501), I put forward two tests that guide our intuition concerning dispositional ascriptions, namely, the conditional and nomic duplicate tests. I believe that the two tests back up my claim that $O$ is not fragile. I will not go into the detail of them to avoid digression, though.

[23] The difference between $M$ and $M^\star$ merely reflects the fact that different types of microstructure may be associated with different cases of fragility. Therefore, it does not undercut the analogy I make between the case of Chilly and the modification of Martin's fink case.

solubility-specific manifestation is the event of dissolving. This claim needs careful justifications, which I will offer in what follows.

Let us consider Smith's mimicker case again. Most philosophers including Smith (1977, pp. 444–5) and Lewis (1997, p. 145) hold that the steel $S$ is not fragile because if it were to be struck then it would break but not through a certain direct and standard process.[24] This might lead one to require that a fragile object should break through a certain direct and standard process if struck under the ordinary conditions for fragility. On this view, the fragility-specific manifestation is not the simple event of breaking but the event of breaking through a certain direct and standard process. In general, it might be suggested that the $D$-specific manifestation is the event of exhibiting the $D$-manifestation *through a certain direct and standard process*. This induces us to replace (7) with the following analysis of a conventional disposition $D$:

> (8) Something $x$ has a conventional disposition $D$ at time $t$ iff, if $x$ were to undergo the $D$-stimulus at $t$ under the ordinary conditions for $D$, then $x$ would exhibit the $D$-manifestation through a certain direct and standard process.

For example, $x$ is fragile iff it would break through a certain direct and standard process if struck under the ordinary conditions for fragility. I take it though that this revision is not a profitable move.

Among other things, (8) does not have any advantages over (7) at all. First of all, just like (8), (7) has no problem with Smith's mimicker case. As we have found above, given that the ordinary conditions for fragility include that there are no Z-rays, (7) gets Smith's mimicker case right. This means that, despite appearance, Smith's mimicker case gives no good motivation for giving up (7) in favour of (8). Secondly and more importantly, I maintain that when the concept of a direct and standard process is properly understood, it will turn out that (7) is in effect equivalent to (8). The question is what is a direct and standard process for a dispositional property. Although such philosophers as Smith and Lewis invoke the concept of a direct and standard process for a dispositional property, they give no clue at all to how to answer this question. I propose that we can spell out the concept of a direct and standard process for $D$ in terms of the ordinary conditions for $D$. Suppose that, for a conventional disposition $D$, an object $x$ undergoes the $D$-stimulus and then exhibits the $D$-manifestation through a process $P$. My suggestion is:

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[24] Similar ideas can be found in Prior, Pargetter and Jackson 1982 (p. 252), Prior 1985 (pp. 9–10), and Armstrong 1997 (p. 71).

(9)   *P* is a direct and standard process for *D* iff, if *x* were to undergo the *D*-stimulus under the ordinary conditions for *D*, then it would exhibit the *D*-manifestation through *P*.

To put another way, to say that *x* exhibits the *D*-manifestation through a direct and standard process is to say that if it were to undergo the *D*-stimulus under the ordinary conditions for *D*, then it would exhibit the *D*-manifestation through the same process as it actually does. For example, when an object is submerged into water and dissolves through a process *P*, *P* is a direct and standard process for water-solubility iff, if it were submerged into water under the ordinary conditions for water-solubility, then it would dissolve through *P*.

It is agreed that, in Smith's mimicker case, the steel *S*, which breaks as a result of the operation of the Z-rays, does not break through a certain direct and standard process for fragility. Does (9) get it right? The ordinary conditions for fragility include that there are no Z-rays. In addition, if *S* were to be struck under the ordinary conditions for fragility, that is, in the absence of the Z-rays, it would not break; thereby, it would not break through the same process as it actually does. It therefore follows that, according to (9), *S* does not break through a direct and standard process for fragility, which is a satisfying result.

Let us now consider Lewis's (1997, p. 146) case of HIV. Most lethal viruses kill by directly attacking vital systems in the body, but HIV kills by weakening the immune system. Nevertheless I agree with Lewis that HIV kills through a direct and standard process for lethality, which is supported by (9). Suppose that John is infected with HIV which debilitates his immune system. And suppose further that he is also infected with a common and prevalent strain of influenza virus in air. Normally, flu viruses do not kill people. But since John's immune system has been emasculated by HIV, he is immediately killed. Note that in this case HIV's killing John does not depend on anything that would be excluded from the ordinary conditions for lethality. Among other things, given that the strain of flu virus under discussion is common and prevalent in air, it is not ruled out from the ordinary conditions for lethality, that is, the extrinsic conditions that are ordinary to the possessors of the concept of lethality. Hence, if John were to be infected with HIV under the ordinary conditions for lethality then it would still kill him through the same process as it actually does, that is, by debilitating the immune system. This means that, according to (9), HIV kills John through a direct and standard process for lethality.

Until now I have focused my attention on HIV's killing John. It is to be noted though that there is also a good sense in which John is killed by the strain of flu virus. If so, it will be interesting to see if it kills John through a direct and standard process for lethality. The question is whether or not the flu virus would kill John through the same process as it actually does if John were to be infected with it under the ordinary conditions for lethality. Here it is important to realize that at present HIV is not common and prevalent enough to be included under the ordinary conditions for lethality. HIV therefore is ruled out from the ordinary conditions for lethality. This entails that if John were to be infected with the strain of flu virus in question under the ordinary conditions for lethality, he would not be killed since his immune system would serve to protect him from the flu virus. As a consequence, according to (9), the flu virus does not kill John through a direct and standard process for lethality. Indeed, according to (7), the flu virus is not lethal. For John would not die even if infected with the flu virus under the ordinary conditions for lethality. I believe that this result is in line with our common sense opinion.

What if we suppose that HIV becomes so rampant that it is pervasive? In this case, HIV would not be ruled out from the ordinary conditions for lethality. If so, in a counterfactual situation where John is infected with the strain of flu virus in question under the ordinary conditions for lethality, John's immune system would still be disabled by HIV; and thereby it would not protect him from the attack of the flu virus; as a result of this, John would be killed. Then it follows that it is a true counterfactual conditional that if John were to be infected with the strain of flu virus under the ordinary conditions for lethality, he would still be killed through the same process as he is actually killed. Consequently, on the supposition that HIV is pervasive, according to (9), the flu virus kills John through a direct and standard process for lethality. In fact, on the assumption that HIV is prevalent, the flu virus comes out as being lethal by (7). For John would die if infected with the flu virus under the ordinary conditions for lethality. I take it that this result is agreeable to our intuition. After all, should HIV become extremely rampant, we would take even common flu viruses as a serious menace to our lives.

Let us carry on to another example where an object has exactly the same intrinsic properties as a piece of steel except that it has the intrinsic disposition to get the microstructure of a fragile glass soon enough if struck. Suppose further that it is struck and then breaks by the 'reverse finkish operation' of that intrinsic disposition, namely, by

instantly acquiring the microstructure of a fragile glass. It is clear that this object does not break through the normal process of fragile objects which does not involve the reverse finkish operation. I think none the less that it breaks through a direct and standard process for fragility. Given that the ordinary conditions for fragility are extrinsic conditions, the *intrinsic* disposition to get the microstructure of a fragile glass is not ruled out from the ordinary conditions for fragility. From this it follows that if the object in question were to be struck under the ordinary conditions for fragility, it would still break through the same process as it actually breaks, that is, by the reverse finkish operation of one of its intrinsic dispositions. Then, according to (9), the process through which the object actually breaks is a direct and standard process for fragility. This is so despite the fact that it differs from the process by which most fragile objects break. In fact, (7) delivers the verdict that the object under discussion is fragile since it would break if struck under the ordinary conditions for fragility, which I think is in keeping with our intuition.[25]

Let us consider another example that I presented in Choi 2005a.[26] A fragile glass is struck at *t* and then breaks; yet, it breaks not because it is fragile but because a time bomb explodes in the vicinity of it. It is clear that this glass does not break through a direct and standard process for fragility, with which (9) agrees. The ordinary conditions for fragility include that the time bomb is not operative. In addition, if the glass were to be struck at *t* under the ordinary conditions for fragility, that is, in the absence of the time bomb, it would break through the normal process of fragile objects, not through the same process as it actually breaks. Therefore, according to (9), the glass does not actually break through a direct and standard process for fragility. It is noticeable that, although the glass does not break through a direct and standard process, it comes out fragile by (7). For, if it were to be struck at *t* under the ordinary conditions for fragility, it would break, albeit through a different process than it actually breaks. This is, obviously, a gratifying result.

We have seen that (9) gets a variety of cases right, which gives us more than enough reasons to accept (9) as an adequate definition of a direct and standard process for a disposition. Suppose that if *x* were to undergo the *D*-stimulus under the ordinary conditions for *D* it would exhibit the *D*-manifestation. Then, according to (9), *x* would by definition exhibit the *D*-manifestation through a direct and standard process

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[25] We can recognize that this verdict is agreeable by considering the conditional and nomic duplicate tests I proposed in Choi 2005b.

[26] A similar case can be found in Armstrong 1997 (p. 71).

for *D*. If so, (7) is equivalent to (8). Having said that, it is redundant to incorporate into (7) the additional requirement to exhibit the *D*-manifestation through a certain direct and standard process. For this reason, I stick to (7).

## 7. Mumford on Dispositions

I have thus far proposed a new version of the simple conditional analysis of dispositions, namely, (7) and defended it in respect of the *D*-specific stimulating circumstance and manifestation. To see the strength of my proposal, it will be instructive to compare it with Stephen Mumford's view of dispositions. Mumford (1998, pp. 88–90) declares that the simple conditional analysis of dispositions is dead and claims that '*x* has a disposition *D*' entails but is not entailed by the following counterfactual conditional involving the concept of ideal condition: if the ideal conditions obtain, then if *x* were to undergo the *D*-stimulus, then it would exhibit the *D*-manifestation—call this counterfactual conditional 'conditional conditional'. The ideal conditions are provisionally extrinsic conditions in which the *D*-manifestation does follow from the *D*-stimulus. Mumford takes it that what counts as an ideal condition is relative to a specific context of a disposition ascription: 'to say something is soluble is to say it will dissolve, in liquid, in a context relative to the ascription' (Mumford 1998, p. 89). He goes on to say that such tricky cases as Bird's antidote case and Martin's fink case cause no problems for the claim that the ascription of fragility entails his conditional conditional for fragility on the grounds that, in ordinary contexts of the ascription of fragility, extrinsic sundries that would interfere a causal process from striking to breaking are ruled out from the ideal conditions. Further, Mumford asserts that we can provide a criterion for distinguishing between dispositional and categorical properties in terms of entailing his conditional conditionals. On his view, dispositional ascriptions entail his conditional conditionals but categorical ascriptions do not.

The first comment I want to make on Mumford's account is that it can be best considered as an account of conventional dispositions, not an account of dispositions in general. When we associate such conventional dispositions as fragility and water-solubility with counterfactual conditionals, we have to include into the counterfactual conditionals references to standard extrinsic conditions because conventional dispositions contain implicit references to them. This being the case, it is arguable that those conventional dispositions entail Mumford's condi-

tional conditionals that involve ideal conditionals. As already indicated, however, not all dispositions are conventional dispositions. For example, there are such canonical dispositions as *the disposition to break in response to being struck* and *the disposition to dissolve in response to being submerged into water* that, by definition, contain no implicit references to standard extrinsic conditions. This means that the counterfactual conditionals that are associated with them do not include references to standard extrinsic conditions. As a result of this, for instance, '*x* is disposed to break in response to being struck' does not entail any of Mumford's conditional conditionals that involve ideal conditions. This reveals that Mumford's account does not cater for unconventional dispositions like the disposition to break in response to being struck and the disposition to dissolve in response to being submerged into water. In view of this, I suggest that Mumford's intention can be best understood to give an account of conventional dispositions. On this understanding, Mumford's claim is that '*x* has a *conventional disposition D*' entails but is not entailed by the counterfactual conditional that if the ideal conditions obtain, then if *x* were to undergo the *D*-stimulus, then it would exhibit the *D*-manifestation. In accordance with this understanding, we need to restrict the scope of Mumford's criterion for the dispositional/categorical distinction: it is a criterion for distinguishing conventional dispositional properties from categorical properties in terms of entailing his conditional conditionals. On this construal, Mumford's criterion is that conventional dispositional ascriptions entail his conditional conditionals but categorical ascriptions do not.

Taken this way, I hold, Mumford's criterion for the dispositional/categorical distinction is more plausible than thought by critics. In this regard, I argued in Choi 2005b that Mumford's criterion is not threatened by a variant on Hugh Mellor's (1974, p. 171) observation that, although triangularity is one of the most likely categorical properties, '*x* is triangular' entails the counterfactual conditional that if the ideal conditions obtain, then if the corners of *x* were to be correctly counted the result would be three; and therefore that there is no distinction between dispositional and categorical properties in terms of entailing Mumford's conditional conditionals. The key point was that Mellor's observation is mistaken. Suppose that a triangular object *T* has the intrinsic disposition to become rectangular in response to its corners being counted.[27] If the corners of *T* were to be correctly counted, it would

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[27] It might be objected that, given that T has the intrinsic disposition to become rectangular in response to its corners being counted, it is no longer triangular. But I rebutted this possible objection in Choi 2005b (pp. 502–3).

become rectangular because of one of its intrinsic dispositions, and thereby the result would not be three. What if we assume that the ideal conditions obtain? We would have the same result. The ideal conditions are, among other things, conditions extrinsic to *T*. Hence even if the ideal conditions obtain, if its corners were correctly counted the result would not be three, for its own i*ntrinsic* disposition would join with the counting to render it rectangular soon enough. That said, the object *T* is triangular but it is false that if the ideal conditions obtain, then if its corners were correctly counted the result would be three. Consequently, the ascription of triangularity does not entail that if the ideal conditions obtain, then if the corners of *T* were correctly counted the result would be three. From this I concluded that Mellor's observation poses no problem for Mumford's criterion for distinguishing between dispositional and categorical properties in terms of entailing his conditional conditionals.

In fact, I take it that Mumford's view of dispositions, when properly understood in a way I suggested above, is broadly on the right track, particularly in so far as there is a close similarity between his conditional conditional for a conventional disposition *D* and the analysans of (7) for a conventional disposition *D*, namely, that *x* would manifest a disposition *D* if it were to undergo the *D*-stimulus under the ordinary conditions for *D*. None the less, there are significant points of difference between the two counterfactual conditionals. In what follows, I will sift through them one by one and demonstrate that there are plenty of things to be improved about Mumford's account of dispositions. In the end I will reach the conclusion that, when Mumford's account of dispositions is appropriately improved, it is inevitably transformed into my account of conventional dispositions represented by (7).

The first salient difference between Mumford's conditional conditional and the analysans of (7) is that, whilst the first is a nested counterfactual conditional whose consequent is a counterfactual conditional, the second is not.[28] On this issue, I think, Mumford is in the wrong. To show this, I will present a counterexample to Mumford's claim that the ascription of fragility entails his conditional conditional for fragility and then discuss how he can get around it.

Let us modify Bird's antidote case in the following way. The glass $G_1$ is guarded by the sorcerer who serves as a fragility-antidote. But this time $G_1$ moves so unpredictably and elusively that a magic skill is required to strike it. Only the sorcerer has this magic skill. The sorcerer herself strikes $G_1$ but $G_1$ does not break because she immediately casts a

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[28] I thank the anonymous referee for calling my attention to this difference.

spell that frustrates the process of breaking. It is evident that the additional assumption of the magic skill does not attenuate our intuition that $G_1$ is fragile. For instance, we may reinforce our intuition by imagining a nomic duplicate of $G_1$ that is not protected by the sorcerer. Let us now examine the truth value of the nested counterfactual conditional that if the ideal conditions obtain, then $G_1$ would break if struck. We noted above that the sorcerer is ruled out from the ideal conditions in ordinary contexts of the ascription of fragility. That said, we may rephrase the counterfactual conditional in question as the one saying that if $G_1$ is situated in the absence of the sorcerer, then it would break if struck.

Since we need to evaluate the truth value of a pretty complex nested counterfactual conditional, for the sake of presentation, it will be useful to employ Lewis/Stalnaker possible world framework for counterfactual conditionals tentatively. Suppose that *Wa* is one of the closest possible worlds to the actual world where $G_1$ is situated in the absence of the sorcerer. If so, our question is whether, in *Wa*, it is true or not that $G_1$ would break if struck. It depends upon what the closest possible worlds to *Wa* where $G_1$ is struck would be like. Here we need to note that, on the assumption that the sorcerer's magic skill is required to strike $G_1$, it is a true counterfactual conditional (in the actual world) that if $G_1$ were struck it would be struck by the sorcerer. Further, we may plausibly suppose that, even if $G_1$ were situated in the absence of the sorcerer, the sorcerer's magic skill would still be required to strike $G_1$. On this supposition, the following counterfactual conditional is true in *Wa*: if $G_1$ were struck it would be struck by the sorcerer. That is, in the closest possible worlds to *Wa* where $G_1$ is struck, it would be struck by the sorcerer. This is so despite the fact that, in *Wa*, $G_1$ is situated in the absence of the sorcerer. In the possible worlds where $G_1$ is struck by the sorcerer, however, the sorcerer would immediately cast a spell that would cancel out the shock of the striking, and hence $G_1$ would fail to break. This means that, in *Wa*, it is false that $G_1$ would break if struck. If so, it is false (in the actual world) that, if $G_1$ were situated in the absence of the sorcerer, it would break if struck.

In general, when we let $W$ be one of the closest possible worlds to the actual world where the ideal conditions obtain, there is no guarantee that in the closest possible worlds to $W$ where $x$ undergoes the $D$-stimulus the ideal conditions would still obtain. This means that, even if $x$ has $D$, there is no guarantee that, in the closest possible worlds to $W$ where $x$ undergoes the $D$-stimulus, $x$ would exhibit the $D$-manifestation. This opens the possibility that, even if $x$ has $D$, it is false that if the

ideal conditions obtain, if $x$ were to undergo the $D$-stimulus it would exhibit the $D$-manifestation. This is why I believe that the conditional conditional, in its current form, does not serve Mumford's purpose of constructing a counterfactual conditional that is entailed by the corresponding dispositional ascription.

In fact, Mumford's purpose will be better served by the following counterfactual conditional: if $x$ were to undergo the $D$-stimulus in the ideal conditions, it would manifest $D$. Let us consider again the modified version of Bird's antidote case. On the assumption that the sorcerer's magic skill is required to strike $G_1$, if $G_1$ were struck it would be struck by the sorcerer. On the standard view of counterfactual conditionals as variably strict conditionals, however, '$\phi$ & $\psi \Box\!\!\rightarrow \kappa$' does not follow from '$\phi \Box\!\!\rightarrow \kappa$'.[29] To put it another way, from a counterfactual conditional $C$, we cannot legitimately infer a counterfactual conditional that has the same consequent as $C$ but has a logically stronger antecedent than $C$. Therefore, from the fact that if $G_1$ were struck it would be struck by the sorcerer, it does not follow that if $G_1$ were struck in the absence of the sorcerer then it would be struck by the sorcerer. In fact, in the closest possible worlds to the actual world where $G_1$ is struck in the absence of the sorcerer, $G_1$ would be supposed to be struck in the absence of the sorcerer.[30] If so, in such possible worlds, $G_1$ would break because there would be no interference by the sorcerer. From this I come to the conclusion that it is true that if $G_1$ were to be struck in the absence of the sorcerer it would break, which is a satisfying result as $G_1$ is assumed to be fragile.

In general, in the closest possible worlds to the actual world where $x$ undergoes the $D$-stimulus in the ideal conditions, $x$ would be supposed to be situated in the ideal conditions. If so, the process from the $D$-stimulus to the $D$-manifestation would not be interrupted by any external factors. In view of this, assuming that $x$ has a conventional disposition $D$, it may be plausibly claimed that if $x$ were to undergo the $D$-stimulus in the ideal conditions, it would exhibit the $D$-manifestation. But this is exactly what Mumford intends to achieve by his conditional conditionals. This leads us to the idea that it would be better for Mumford to formulate his conditional conditional not as a nested counterfactual conditional but as a counterfactual conditional of the form that if $x$ were to undergo the $D$-stimulus in the ideal conditions, it would

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[29] For more detail, see Lewis 1973 (pp. 31–2).

[30] In such possible worlds, $G_1$ would be struck but not by the sorcerer. Given that the sorcerer's magic skill is assumed to be necessary to strike $G_1$ in the actual world, therefore, they are farther from the actual world than the possible worlds where $G_1$ is struck by the sorcerer.

exhibit the *D*-manifestation. To move my discussion forward without confusion, in the following I will refer to this second counterfactual conditional by 'Mumford's conditional conditional'.

On the recommended formulation of Mumford's conditional conditional, basically it says the same thing as the analysans of (7), namely, that *x* would manifest a conventional disposition *D* if it were to undergo the *D*-stimulus under some standard extrinsic conditions. Still, however, there are some remaining differences between the two. One of them is that Mumford's conditional conditional involves ideal conditions, whilst the analysans of (7) involves ordinary conditions. In this connection, Mumford leaves it murky exactly how the ideal conditions are determined by the context of ascription (Carroll 2001, p. 83; Hawthorne and Manley 2005, p. 181). As a result of this, it is not clear at all how to spell out the concept of ideal condition that Mumford has in mind. But I suggest we can get round this problem by putting ordinary conditions in place of ideal conditions with the result that Mumford's conditional conditional for a disposition *D* is that if *x* were to undergo the *D*-stimulus under the ordinary conditions for *D*, then it would exhibit the *D*-manifestation, which is equivalent to the analysans of (7) for *D*. The concept of ordinary condition is much clearer than the concept of ideal condition, as can be seen from the fact that the ordinary conditions for *D* are explicitly defined to be extrinsic conditions that are ordinary to those who possess the corresponding dispositional concept. Mumford (1998, p. 89) admits that, in most cases, ideal conditions agree with normal or ordinary conditions. Nevertheless he prefers ideal conditions to normal or ordinary conditions for the reason that some dispositional ascriptions are made under very extraordinary conditions. We have found though that Mumford's reason is not a good reason for rejecting the concept of ordinary condition. If so, it is a profitable move to substitute ordinary conditions for ideal conditions in Mumford's conditional conditionals.

The final and most important difference between Mumford's conditional conditional and the analysans of (7) is that, whilst the second is intended to be necessary and sufficient for a dispositional ascription, the first is intended to be only necessary but not sufficient for a dispositional ascription. But I take it that, despite Mumford's own view, his conditional conditionals can be better understood to be sufficient as well as necessary for dispositional ascriptions. As noted earlier, just like the analysans of (7), Mumford's conditional conditional says that if *x* were to undergo the *D*-stimulus under some standard extrinsic conditions it would exhibit the *D*-manifest. Along with this observation, the

success of (7) indicates that Mumford's conditional conditional can be better seen as a necessary and sufficient condition for a dispositional ascription (on the assumption that the concept of ideal condition is understood in an appropriate way). But Mumford urges that his conditional conditionals are only necessary but not sufficient for dispositional ascriptions, and therefore that his proposal falls short of being an analysis of dispositional properties.

It is because of Martin's cases that Mumford (1998, p. 66; p. 81) denies that his conditional conditionals are sufficient for dispositional ascriptions. Probably he has in mind Martin's reverse fink case where if a piece of steel were to be struck it would break because, quick as a flash, a sorcerer would cast a spell that renders it fragile. But it is not clear at all that the sufficiency claim is in trouble because of Martin's reverse fink case. As noted above, on Mumford's view, in ordinary contexts of the ascription of fragility, extrinsic sundries that would interfere a causal process from striking to breaking are ruled out from the ideal conditions. And, assuming that we exclude the sorcerer from the ideal conditions relative to an ordinary context of the ascription of fragility, Mumford's conditional conditional for fragility is not true of the steel since if it were to be struck under such ideal conditions it would not break. Therefore, the sufficiency claim is not in trouble with the fact that the steel is not fragile. With this in mind, I would say that Mumford is mistaken in denying the sufficiency of his conditional conditionals for dispositional ascriptions.[31] Thus Mumford's view can be strengthened as the view that his conditional conditionals are sufficient as well as necessary for dispositions. In fact, this move is natural from Mumford's overall point of view. For Mumford, a dispositional ascription is a functional characterization of a property: 'it is to characterize a property according to what effect it will produce in a particular circumstance or, in other words, the role that the property plays midway between a stimulus/manifestation pair of events' (Mumford 1998, p. 75). Mumford's conditional conditional is intended to specify this functional role, which is, I take it, in accord with the idea that Mumford's conditional conditionals are sufficient as well as necessary conditions for dispositional ascriptions.

My suggestion also makes it possible to overcome one compelling objection to Mumford's criterion for the distinction between dispositional and categorical properties. Recently it has been objected that even such a categorical property as *being struck* qualifies as a dispositional property by Mumford's criterion (Cross 2005, pp. 327–8; Haw-

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[31] The same concern is raised by Carroll (2001, p. 83) and Hawthorne and Manley (2005, p. 186).

thorne and Manley 2005, p. 185). Suppose that fragility comes out a dispositional property by Mumford's criterion. Then '$x$ is fragile at a time $t$' entails the corresponding conditional conditional, namely

    (10)  If $x$ were to be struck at $t$ under the ideal conditions, then it would break.

But it follows from this that '$x$ is struck at $t$' entails

    (11)  If $x$ were to be fragile at $t$ under the ideal conditions, then it would break.[32]

As a result, given that fragility qualifies as a dispositional property by Mumford's criterion, the property of being struck, which is one of the most likely categorical properties, does so as well.

    Cross (2005, pp. 336–8) canvasses one of Mumford's possible responses to this objection that is based on the observation that the ideal conditions for fragility may be different from the ideal conditions for being struck. Given that Mumford has not done much in the way of clarifying the concept of ideal condition, however, he is not in a good position to take advantage of the difference between the ideal conditions for fragility and for being struck. Having said above that Mumford's conditional conditional should be seen as a sufficient as well as necessary condition for a dispositional ascription, I hold, the best response by Mumford is to strengthen his criterion for the distinction between dispositional and categorical properties in the following way:

    (12)  A property $P$ is dispositional iff there exists a conditional conditional $C$ that is *logically equivalent* to the ascription of $P$.[33]

And there exists no conditional conditional that is logically equivalent to a categorical ascription.

    Suppose that fragility counts as a dispositional property by (12). Then $x$ is fragile at $t$ iff (10) is true. Does it follow from this that, accord-

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[32] As Cross (2005, p. 336) and Bird (2003, p. 168) point out, it seems that, from the fact that (10) is entailed by '$x$ is fragile at $t$', it does not necessarily follow that (11) is entailed by '$x$ is struck at $t$'. This is due to the apparent possibility of a certain type of external inferences that would thwart the second entailment but would not thwart the first entailment. But Cross (pp. 337-8) plausibly argues that, when the ideal conditions—to use his words, 'conditions $C$'—are properly understood as the kind of background conditions that we actually presuppose when making dispositional ascriptions, such external inferences are ruled out from the ideal conditions in all contexts of dispositional ascription. More precisely, when the ideal conditions are to rule out a certain type of external inferences in such a way as to guarantee the first entailment, it also rules out other types of external inferences in such a way as to guarantee the second entailment. Therefore, on the assumption that (10) is entailed by '$x$ is fragile at $t$', (11) is entailed by '$x$ is struck at $t$'. From this, Cross concludes that categorical ascriptions like the property of being struck do entail the corresponding conditional conditionals.

ing to (12), the property of being struck is a dispositional property as well? I do not think so. Arguably, from

> '*x* is fragile at *t* iff [((*x* is struck at *t*) & (*x* is under the ideal conditions at *t*)) $\Box\!\!\rightarrow$ (*x* breaks)]'

we can derive

> '*x* is struck at *t only if* [((*x* is fragile at *t*) & (*x* is under the ideal conditions at *t*)) $\Box\!\!\rightarrow$ (*x* breaks)]'

That is, arguably,

> '*x* is fragile at *t* iff (10) is true'

entails

> '*x* is struck at *t* only *if* (11) is true'

However, it is obvious that '*A* iff [(*B*&*C* $\Box\!\!\rightarrow$ *D*)]' does not entail '*B if* [(*A*&*C* $\Box\!\!\rightarrow$ *D*)]'.[34] Therefore,

> '*x* is fragile at *t* iff [((*x* is struck at *t*) & (*x* is under the ideal conditions at *t*)) $\Box\!\!\rightarrow$ (*x* breaks)]'

does not entail

> '*x* is struck at *t if* [((*x* is fragile at *t*) & (*x* is under the ideal conditions at *t*)) $\Box\!\!\rightarrow$ (*x* breaks)]'

As a consequence, it does not follow from the fact that *x* is fragile at *t* iff (10) is true, that *x* is struck at *t* if (11) is true. If so, it does not follow

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[33] I said earlier that Mumford can be best interpreted to associate his conditional conditionals with canonical dispositions and hence that his criterion for the dispositional/categorical distinction should be taken as a criterion for distinguishing conventional dispositions from categorical properties. Taken this way, (12) must be qualified in the following way: a property *P* is a *conventional* disposition iff there exists a conditional conditional *C* that is logically equivalent to the ascription of *P*. Since this qualification is not directly relevant in the present context, however, for simplicity I will carry on my subsequent discussion without it.

[34] Consider the following assignment of sentences to the symbols:

> *A*:  '2 + 2 = 4'
> *B*:  'I die at *t* + '
> *C*:  'I am stabbed at *t*'
> *D*:  'I die at *t* + '

On this interpretation, '[*A* iff (*B*&*C* $\Box\!\!\rightarrow$ *D*)]' is true. But '[*B* if (*A*&*C* $\Box\!\!\rightarrow$ *D*)]' is logically equivalent to '[*D* if (*C* $\Box\!\!\rightarrow$ *D*)]' which is false. If I were to be stabbed at *t*, I would die at *t* + δ, which means that '(*C* $\Box\!\!\rightarrow$ *D*)' is true. But actually I do not die at *t* + δ , which means that '*D*' is false. Therefore, '[*D* if (*C* $\Box\!\!\rightarrow$ *D*)]' is false. Therefore, on the interpretation under consideration, '[*A* iff (*B*&*C* $\Box\!\!\rightarrow$ *D*)]' is true but '[*B* if (*A*&*C* $\Box\!\!\rightarrow$ *D*)]' is not. This means that the first does not entail the second.

from the fact that fragility comes out a dispositional property by (12), that the property of being struck comes out a dispositional property by (12).

Moreover, it is not difficult to demonstrate that it is false that $x$ is struck at $t$ if (11) is true. Consider a sturdy object $O$ that would not break if struck. Suppose that $O$ is made up of such a material that it has the intrinsic disposition to break if subject to any significant change in its molecular structure. Then even if we suppose that $O$ is not struck at $t$, (11) is true of it. For if it were to be fragile at $t$ under the ideal conditions, it would undergo a significant change in its molecular structure; thereby, thanks to the operation of one of its intrinsic dispositions, it would break. This means that (11) is not a sufficient condition for $x$'s being struck. Then we reach the conclusion that it is not the case that $x$ is struck at $t$ iff (11) is true, and therefore that the property of being struck is excluded from being a dispositional property by (12).

In short, the claim that the property of being struck comes out a dispositional property by (12) is not only not derivable from the assumption that fragility comes out a dispositional property by (12) but also it is an outright falsehood. This means that, unlike Mumford's original criterion for distinguishing between dispositional and categorical properties, (12) has no problems with the property of being struck.[35] This, l believe, serves as a good motivation for Mumford to strengthen his criterion along the line of (12). But this move is predicated on the idea that Mumford's conditional conditionals are sufficient as well as necessary for dispositions.

As I pointed out before, Mumford puts forward Martin's cases as a reason to deny that his conditional conditionals are sufficient for dispositions. But it has come to light that this is a bad reason. Further, I have demonstrated that, under Mumford's functionalist approach to dispositional properties, his conditional conditionals are better considered as sufficient as well as necessary conditions for dispositions. Finally, I have established that Mumford can get around an otherwise compelling criticism of his criterion for the dispositional/categorical distinction by strengthening it in a way that is motivated by the idea that Mumford's conditional conditionals are necessary and sufficient for dispositions. Keeping this in mind, I come to the conclusion that there are more than enough reasons to make Mumford's position stronger by taking his conditional conditionals to provide an analysis of dispositions.

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[35] Needless to say, this does not guarantee that (12) offers a successful criterion for the distinction between dispositional and categorical properties. The issue will be discussed in detail elsewhere, though.

To recapitulate, I have carried out a careful examination of Mumford's account of dispositions with reference to (7). As a result of this, it has come to light that his conditional conditionals are better formulated in terms of simple counterfactual conditionals rather than nested counterfactual conditionals; and that the concept of ideal conditions should be eliminated in favour of the concept of ordinary conditions; and finally that his conditional conditionals are better taken to provide an analysis of dispositions. When these results are pieced together, they point to the fact that Mumford's position of dispositions, when appropriately improved, is transformed into my position as represented by (7). I believe that this will give a further boost to (7).

## 8. A Concluding Remark

To take stock of what I have claimed thus far, the simple conditional analysis of dispositions as formulated by means of (SCA) is an adequate analysis of canonical dispositions; furthermore, from (SCA), we can develop a highly defensible analysis of conventional dispositions, namely, (7); and, the simple conditional analysis of dispositions gives us a better understanding of what is right and what is wrong about Mumford's view of dispositions and how to improve it. This, I think, gives a compelling reason to subvert the general consensus that the simple conditional analysis of dispositions is dead.

It goes without saying that there are more questions about dispositional properties yet to be answered than those that were answered in this paper. In this connection, I must admit that I have not addressed one important problem for the simple conditional analysis of dispositions. The problem is that, on the Lewis/Stalnaker semantics for counterfactual conditionals according to which the truth of the counterfactual conditional that if it were to be the case that *A* then it would be the case that *B* is derivable from the truth of *A* and *B*, (SCA) says that the truth of *A* and *B* entails that *B* is disposed to be the case when *A* is the case even if *A* and *B* are completely unrelated (Gundersen 2002, p. 393; 2004, pp. 10–11; Bird 2003, p. 159). I believe that this is a real problem which requires a substantial refinement of (SCA). It will be a topic for another paper, though.[36]

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